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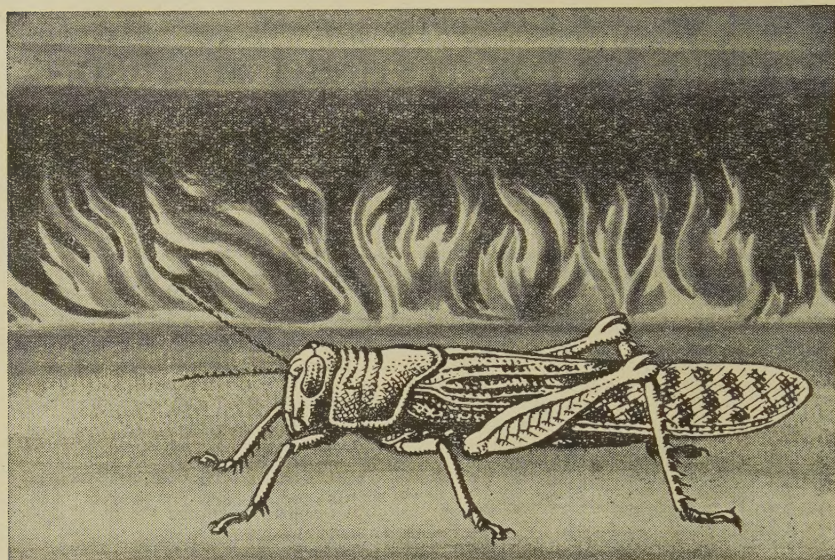
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GUPTA (B. D.) & AVASTHY (P. N.). **Observations on a new Beetle Pest of Sugarcane Crop in Bihar.**—*Indian Sug.* 7 no. 9 pp. 587–589, 591–594, 11 figs., 5 refs. [Calcutta] 1957.

Sugar-cane was not known to be much damaged by Lamellicorn larvae in India until August 1956, when larvae of a Melolonthid identified as *Lachnosterna consanguinea* (Blanch.) were found injuring the roots and causing large-scale withering of the crop on a farm near Dalmianagar, in Bihar. Observations in 1956–57 showed that the larvae fed on the rootlets and root hairs, causing the main roots to turn black and preventing their normal functioning, so that the whole cane gradually dried up and became useless, even for seed pieces. Considerable areas were affected, and the infestation extended to other farms in the district, on both light and heavy soils. Adult emergence was first observed in the last week of April 1957, at an average maximum temperature between 102 and 105.8°F. and a relative humidity of 27–34 per cent. in the morning and 11–17 per cent. in the evening. Few beetles emerged, however, until early June, when the monsoon rains began, after which large numbers appeared. They were attracted to lights, particularly between 8 and 9 p.m., and fed on the leaves of various trees, those that emerged in the morning sheltering on or in the soil until the evening before doing so. Oviposition occurred in the soil at depths ranging up to 6 in. in sugar-cane fields and elsewhere, and as many as six eggs were laid by one female at a time. At a temperature of 90.5–96°F. in the laboratory, the eggs hatched in 7–8 days. The larvae fed on the roots of wild grasses and weeds, as well as attacking sugar-cane, but attained full size only on the latter. They moved away from damaged canes in search of other food and migrated to greater depths to avoid flooding or abnormally high or low temperatures. Most of them became full-fed in about eight weeks, and they overwintered deep in the soil, this stage being reached by mid-October in 1956. Pupation occurred in earthen cells in the soil, the pupal stage lasting about a month, and larvae, pupae and adults were present in the soil by early November. The life-cycle was thus completed in a year.

Control measures would be best applied in July–September, when the larvae are actively feeding on the roots. Of various insecticides tested in soil treatments, the only one to offer any promise was a 10 per cent. BHC dust applied at 112 lb. per acre, which gave nearly 50 per cent. reduction in population in a month. Mechanical methods were of little use. Cane planted in October suffered less damage than that planted in February, and a combination of cultural and chemical control is being tried, whereby a quick-growing crop would be dusted with BHC and ploughed in as green manure. It is thought that this would result in high mortality of the larvae and thus clear the ground for a subsequent sugar-cane crop.

UCHIDA (T.). **Ein neuer Schmarotzer der Kartoffelmotte in Japan (Hymenoptera, Ichneumonidae).** [A new Parasite of the Potato Moth in Japan.]—*Mushi* 30 pt. 4 pp. 29–30. Fukuoka, 1957.

The potato moth, *Gnorimoschema operculella* (Zell.), has become established in parts of southern Japan in which the solanaceous crops that it infests are grown [cf. *R.A.E.*, A 43 150; 45 208]. An Ichneumonid observed parasitising the larvae at Hirshima in 1955 was found to be identical with one previously known in Japan as an important parasite of the tobacco moth, *Heliothis (Chloridea) assulta* Gn. It is described from adults of both sexes as *Campoletis chloridea*, sp.n., and recorded from Honshu and Kyushu, in Japan, and also from Manchuria.

UCHIDA (T.). **Ueber den Fichtenwickler in Hokkaido und seine Parasiten, mit der Beschreibung neuer Arten.** [On *Eurydoxa sapporensis* in Hokkaido and its Parasites, with the Description of new Species.]—*Insecta matsum.* 20 no. 3-4 pp. 100-103, 2 figs., 2 refs. Sapporo, 1956.

An outbreak of *Eurydoxa sapporensis* (Mats.), which is considered by the author probably to be a synonym of *E. advena* Filip'ev (described from eastern Siberia in 1930), began in the summer of 1956 in a forest of spruce (*Picea*) and fir (*Abies*) near Sapporo, in Hokkaido, principally on *P. jezoensis*. Previously only a few males of this Tortricid had been observed in the island. The larvae, which hatched in September, mined the needles of *P. jezoensis* for a while and then bound the needles together, attacking them from within the webs thus formed. They overwintered in the webs. Satisfactory control of the larvae was obtained by dusting with 5 per cent. γ BHC from a helicopter at a rate of about 45 lb. per acre at the beginning of July, but it is considered that the application should have been made earlier. Parasites reared comprised two Ichneumonids, *Phaeogenes eurydoxae* and *Campoplex* (*Omorgus*) *shikotsensis*, spp.n., which emerged from the pupae and are described from adults of both sexes, *P. spiniger* (Grav.), which also emerged from the pupae, and an unidentified Braconid of the genus *Meteorus* and the Tachinids, *Zenillia* (*Myxexoristops*) *blondeli* (R.-D.), *Z. albipila* Mesn. and *Nemorilla floralis* (Fall.), which emerged from the larvae. *Hemiteles* sp. was reared from some of the cocoons of *Meteorus*. *P. eurydoxae* is also recorded from pupae of *Tortrix* (*Cacoecia*) *xylosteana* (L.), an important pest of apple in Hokkaido.

LIU (Yu-ch'iao), IN (Hui-fen) & TSEN (Siao-tse). **Preliminary Observations on the Bionomics of *Dendrolimus punctatus* Walker in the Province of Hunan.** [In Chinese.]—*Acta ent. sin.* 7 no. 1 pp. 21-51, 9 graphs, 1 map, 3 refs. [Peking] 1957. (With a Summary in Russian.)

Dendrolimus punctatus (Wlk.) is an important pest of pines (*Pinus massoniana*) in the Province of Hunan, China, particularly in the hilly districts at not more than about 650 ft. altitude. It has two complete generations and a partial third in the year, the proportion of the third generation being greater (up to 30 per cent.) in the south of the Province than in the north. The eggs are laid in groups on the foliage, the females laying up to 700-800 each, though the average is about 300-400, and the larvae feed voraciously on the needles and are a nuisance because of their urticating hairs. Winter is passed in the larval stage. Damage is most severe on young trees and in unmixed stands, but little mortality results, even when the attack is heavy. Cold springs and prolonged drought are unfavourable for the larvae. The population increase is also limited by natural enemies and by lack of food, which results in reduced fecundity. Infestation was much less in 1955 than in 1954, and was severe in only two districts.

CHUNG (Chi-chien), WEI (Hung-chuen) & CHI (Ruey-lin). **The Control of Soil Insects with "BHC Poison Grain".** [In Chinese.]—*Acta ent. sin.* 7 no. 1 pp. 53-65, 3 figs., 18 refs. [Peking] 1957. (With a Summary in English.)

Laboratory and field tests in northern China in 1952-55 showed that poisoned baits consisting of grain (crushed if large) mixed with BHC gave effective control of wireworms, Lamellhorn larvae and mole-cricket. Seed-cake fertilisers (such as soy-bean cake) were good substitutes for the grain,

and BHC mixed with the farm manure applied to the soil at the time of sowing or transplanting was highly toxic to the wireworms and Lamellicorns.

WU (Jsu-yun). **Preliminary Studies on the Tobacco Leaf-miner, *Gnorimoschema operculella* (Zeller).** [In Chinese.]-*Acta ent. sin.* 7 no. 1 pp. 67-88, 3 graphs, 10 refs. [Peking] 1957. (With a Summary in English.)

Gnorimoschema operculella (Zell.) infests tobacco in the region of Kweichow, attacking 30-40 per cent. of the plants. It has five overlapping generations a year in south-western China, and all stages overwinter. Effective control is given by spraying with 0.01 per cent. γ BHC or 1 per cent. DDT as soon as the larvae appear and destroying the alternative food-plants on which overwintering occurs.

YAN (Yu-ch'ian), CHOU (Shi-hsiu), LI (Chao-lin) & IN (Hui-fen). **Preliminary Investigations on the Small Poplar Aegeriid (*Paranthrene tabaniformis* Rtt.) in the Environs of the City of Peking.** [In Chinese.]-*Acta ent. sin.* 7 no. 1 pp. 89-104, 4 pls., 1 graph, 8 refs. [Peking] 1957. (With a Summary in Russian.)

Species of poplar are extensively used in China in shelter belts and along avenues. The growing trees are attacked by *Paranthrene tabaniformis* (Rott.), and observations in 1953 showed that the percentage infestation averaged over 10 and ranged up to more than 96. It was heavy in the environs of Peking, where almost all the tree nurseries were infested. In that area, there is one generation a year. The adults emerge in June-July, and the eggs are laid on the bark or in cracks on the trunks over a period of almost ten days. The larvae bore in the trunks and branches, overwintering in their tunnels, and pupate in May, and the pupal stage averages 16.6 days. There is only one generation a year.

CHANG (Yoh) & CHU (Wen-hwei). **Preliminary Studies on the Life History and the Control of the Woolly Aphis (*Eriosoma lanigerum* Hausmann) in Tsingtao District.** [In Chinese.]-*Acta ent. sin.* 7 no. 2 pp. 167-182, 4 figs., 3 refs. [Peking] 1957. (With a Summary in English.)

The aerial form of *Eriosoma lanigerum* (Hsm.) is a major pest of apple in neglected orchards in eastern Shantung, where it causes serious damage and often kills the trees. Observations on its bionomics in 1953-55 showed that an average of 7-8 and a maximum of 17 generations develop each year. First- and second-instar nymphs overwinter in wounds and crevices in the bark; overwintering nymphs and apterous parthenogenetic females were also found at the base of the trunk just below soil level and on the suckers, but the root form of this aphid is of negligible importance. Newly hatched nymphs began migrating to the base of the young shoots in late April and early May, when average temperatures were 11-14.3°C. [51.8-57.74°F.], and migration reached a peak in June and early July. At this time, the life-cycle was completed in 8.2 days and the average number of nymphs produced per female was 94.2. Winged parthenogenetic females that gave rise to apterous parthenogenetic females and sexuales were present between 20th May and 23rd June, and winged migrants that gave rise to apterous males and females developed towards the latter part of August and comprised averages of 23.1 and 46.4 per cent. of the population by 18th September and 18th October, respectively. The fertilised females each laid one egg, but no overwintering eggs were found on the trees, and eggs

obtained in the laboratory or deposited when some hundreds of sexuales were transferred to sterilised wounds on the branches of apple trees in October failed to hatch. Early-instar nymphs were found on the calyces of the fruit but were unable to complete their development there, and none survived in this situation on 20 infested apples stored under room conditions for 50 days in September–October.

Natural enemies were of importance in control in some months of the year and comprised *Aphelinus mali* (Hald.), Coccinellids and Chrysopid and Syrphid larvae. A spray schedule comprising a dormant application of a resin wash diluted 1 in 20 with the addition of 0.02 per cent. wettable γ BHC or of 5–6 per cent. tar distillate, followed by two applications of 0.02–0.03 per cent. γ BHC during early migration (about 15th May and 10th June) is effective.

PASSLOW (T.). **Parasites of Sorghum Midge, *Contarinia sorghicola* (Coq.), in Queensland.**—*Qd J. agric. Sci.* 15 no. 1 pp. 35–36, 7 refs.; also as *Bull. Div. Pl. Ind. Dep. Agric. Qd* no. 118, 2 pp., 7 refs. Brisbane, 1958. **Destruction of Sorghum Midge in Seed Grain.**—*T. c.* pp. 37–38, 2 refs.; also as *Bull. Div. Pl. Ind. Dep. Agric. Qd* no. 119, 2 pp., 2 refs.

In the first paper, records are given of the parasites found attacking *Contarinia sorghicola* (Coq.) in Queensland, based on the literature and on data obtained in 1950–56 from large numbers of samples of sorghums, chiefly *Sorghum vulgare*, collected from most of the districts in which the crop is grown. *Eupelmus australiensis* (Gir.) was the only parasite obtained from the collections, with the exception of two adults of *E. popa* Gir., here recorded from Queensland for the first time, that were reared from the recently introduced *Sorghum alnum* in January 1955. *Eupelmus* sp. near *longicarpus* Gir. and an unidentified species of *Tetrastichus* [cf. *R.A.E.*, A 46 413] were reared from midge-infested Queensland blue grass (*Dichanthium sericeum*) in January 1955 and March 1952, respectively, but may not have been parasitic on *C. sorghicola*, for although the grass is a consistent minor food-plant of this Cecidomyiid, it is also attacked by other species. *E. varicolor* (Gir.) has been recorded parasitising *C. sorghicola* in south-eastern Queensland. Although as many as 11 eggs of *C. sorghicola* may be deposited in a single floret, the number of larvae developing rarely exceeds six, and not more than two parasite larvae were found per floret; 1–4 host larvae and one parasite larva not uncommonly developed concurrently to the pupal stage in the same floret. Some evidence was obtained that larvae of *E. australiensis* can begin development by feeding on plant tissues in the absence of host larvae, and parasite larvae in all stages were found in florets in which there was no sign of oviposition or infestation by *C. sorghicola* [cf. 17 376–377]. Although *E. australiensis* is widely distributed in Queensland and is disseminated in infested sorghum seed, parasitism becomes high only towards the end of the season, partly because the range of conditions that induces the parasite to resume development after overwintering is wider than that in which the Cecidomyiid completes its diapause. The highest percentage of parasites observed in any population sample was 24.2. In late maturing crops, parasites comprised a mean of 14.1 per cent. of the population and were of little economic importance, and parasitism in early and mid-season crops was low.

In the second paper, the author states that larvae of *C. sorghicola* have been found in diapause in many samples of sorghum seed in Queensland and that during the recent expansion of the cultivation of sorghum for grain it appeared in first crops in widely scattered, isolated areas. In a test on control in 1951–52, the numbers of living and (in brackets) dead larvae in 200 aborted spikelets taken from seed grain 11 months after it had been treated

with a dust containing 0.5 per cent. γ BHC at 3 oz. per bushel were 15 (66), as compared with 34 (44) in untreated grain stored for the same period. In a similar test in 1953, in which the concentration of γ BHC in the dust was 1 per cent., the corresponding numbers per 400 spikelets after nine months were 110 (24) in treated and 98 (14) in untreated grain, whereas fumigation with carbon bisulphide at 10 lb. per 1,000 cu. ft. for 24 hours gave complete control. It is concluded that dust treatment combined with cleaning and grading of the seed is adequate for most purposes, but that fumigation is a necessary quarantine measure against the *Cecidomyid*.

MAY (A. W. S.) & HEATHER (N. W.). **Insecticide Trials and Notes on Control of the Potato Tuber Moth in South Queensland.**—*Qd J. agric. Sci.* 15 no. 1 pp. 39–41, 2 refs.; also as *Bull. Div. Pl. Ind. Dep. Agric.* Qd no. 120, 3 pp., 2 refs. Brisbane, 1958.

The standard control measure against *Gnorimoschema operculella* (Zell.) on potato in southern Queensland comprises a schedule of 2–3 sprays of DDT at 1 lb. per acre applied at fortnightly intervals, combined with earthing up 12–14 weeks after planting [cf. *R.A.E.*, A 42 142]. In a test in the spring of 1954, sprays of DDT, dieldrin and endrin all gave some protection, but infestation was too low for statistical analysis of the results. In the spring of 1956, sprays of 0.025 per cent. endrin, 0.05 and 0.025 per cent. dieldrin, and 0.1 per cent. DDT or DDD were applied in mid- and late September and mid-October. All the insecticides significantly reduced the number of larval mines in the foliage at harvest (5th November), and endrin and dieldrin (at both rates) caused significantly greater reductions than DDT or DDD on both 12th October (before the last application) and 5th November. As commercial sprays were applied and the plants correctly earthed up over most of the experimental area, infestation was not high, and there were no significant differences in weight of foliage, yield of tubers or tuber infestation. Larval infestation in foliage sprayed with DDT was comparable with that observed in an experiment in 1950 [*loc. cit.*], when the control plants became reinfested and the weight of foliage and the yield were significantly lower than for the treated ones. It is concluded that DDT is effective and that most poor commercial control is due primarily to faulty timing and application of the spray or inadequate earthing. Sprays of DDT, dieldrin or endrin should be applied to spring crops, but if spraying in autumn becomes necessary, DDT should not be used, since it results in increases in infestation by *Hemitarsonemus latus* (Banks).

BRAITHWAITE (B. M.). **Ground Spray Treatments for Control of Banana Beetle Borer** (*Cosmopolites sordidus* Germ.).—*J. Aust. Inst. agric. Sci.* 24 no. 1 pp. 27–34, 5 figs., 5 refs. Sydney, 1958.

The conversion of the cut spent stems of banana plants into poison baits for the control of *Cosmopolites sordidus* (Germ.) by treating the stump and the basal 6 in. with an insecticide [cf. *R.A.E.*, A 16 533] is compulsory in New South Wales, but although the use of these baits and the enforcement of quarantine regulations have limited the spread of the weevil, it still causes heavy losses in three north-eastern districts. There is little evidence in the literature of the effectiveness of the poison-bait method, and field investigations suggested that it reduces numbers without giving adequate control. At a place where it had been used for many years, the numerous trees uprooted by wind were invariably found to be infested and there was no significant decrease in the number of adults trapped each year. A disadvantage of the method is that only one stem per plant becomes available for bait annually, and each bait remains effective for only one month.

Insecticides applied to the soil or to the base of the plant have been found elsewhere to give satisfactory protection [cf. 42 54; 44 29], and experiments on them were begun in November 1955 in 20 plots in a heavily infested plantation that had been neglected but was restored to a fairly normal state of cultivation before the work began and was surrounded on three sides by old plants, dug up a year before and left on the ground, which were also heavily infested. Populations before and after treatment were assessed from counts of the adults attracted to four sections of stem placed at the bases of central plants of each plot and covered with debris [cf. 27 184]. In 12 of the plots, sprays containing 0.03 per cent. γ BHC, 0.1 per cent. aldrin or 0.05 per cent. dieldrin were applied to the base of each stem to a height of 1 ft. and to the soil within a radius of 1 ft. from each plant and sucker at rates of 0.5, 2 and 1 lb. toxicant per acre, respectively. In four unsprayed plots, the recommended baiting method was carried out, a dust of 4 per cent. BHC being applied initially to each stool and subsequently to cut spent stems as they became available. The aldrin and dieldrin sprays caused initial decreases of about 94 per cent. in the numbers of adults and the populations remained low for ten months except for a temporary increase in May and June, following large-scale emergence in May. The other treatments were ineffective. Rainfall during the 11 months of the experiment amounted to 101 in., exceeding the annual average of 70 in., but although the plots were situated on a steep hill-side, there was little leaching or other movement of insecticide away from the plants. The populations remained high in the four untreated control plots, which indicated that cultural measures, including weed control, the removal of dead leaves, suckers and water suckers, the destruction of fallen stems and corns by cutting up, and the application of fertilisers [cf. 26 210], do not by themselves afford protection.

Larvae, pupae and adults of *C. sordidus* are abundant throughout the year, but the trap counts showed two peaks of adult emergence, in mid-January and mid-May. A flat-worm, *Geoplana coerulea*, which is common in banana plantations, was observed sucking the body fluids of adults beneath the traps.

DEANE (B. C.) & MORRISON (F. O.). **Preliminary Observations on the Clover Root Borer** (*Hylastinus obscurus* Marsham) (Coleoptera: Scolytidae) in Quebec.—38th Rep. Quebec Soc. Prot. Pl. 1956 pp. 34-35, 2 refs. Quebec, 1957.

The following is virtually the authors' abstract. The clover root borer (*Hylastes* (*Hylastinus*) *obscurus* (Marsham)) is present throughout western, southern and central Quebec. The intensity of infestation is independent of soil type and pH. It appears to be associated with the proximity to the previous year's clover fields and to the intensity of clover cultivation in the present year. The adults are distributed by a flight period occurring early in May and lasting only a day or two. Root infestation increases in clover in its first crop year from May until September, when up to 70 per cent. of the roots contain pupae or adults or occasionally full-grown larvae.

FRIEND (W. G.) & HERCOURT (D. G.). **Influence of three Types of Soil on Damage caused by the Cabbage Maggot**, *Hylemya brassicae* (Bouché).—38th Rep. Quebec Soc. Prot. Pl. 1956 pp. 36-39, 8 refs. Quebec, 1957.

In tests in Quebec in 1949 and 1950 to verify the observation that damage by root maggots is more severe on light than on heavy soils [cf. R.A.E., A

21 350], infestation by *Hylemyia* spp. and resultant mortality among cabbage plants were significantly higher in plots on loamy sand than in others on sand or sandy-clay loam. Of the larvae present, 89.7 per cent. were *H. brassicae* (Beh.) and the remainder *H. cilicrura* (Rond.) or *H. trichodactyla* (Rond.).

PARADIS (R. O.). **Factors in the recent Importance of the Red-banded Leaf Roller, *Argyrotaenia velutinana* (Wlkr.) (Lepidoptera: Tortricidae), in Quebec Apple Orchards.**—38th Rep. Quebec Soc. Prot. Pl. 1956 pp. 45-48, 11 refs. Quebec, 1957.

Eulia (*Argyrotaenia*) *velutinana* (Wlk.), which was first reported in Quebec in 1912 and in apple orchards there in 1949, caused severe damage to apple in 1951, when it destroyed 10 per cent. of the crop, and has since been a serious pest. A similar increase in its importance on apple in the United States in 1946-48 [cf. R.A.E., A 37 381; 38 57] was attributed to the replacement of lead arsenate by DDT in sprays against the codling moth [*Cydia pomonella* (L.)] [36 323; 37 382]; DDT was recommended there in 1945-46, but not in Quebec till 1949. During investigations on the situation in Quebec in 1952-55, eight of ten apple orchards in the south of the Province that had been sprayed with DDT against *C. pomonella* during the previous two years, but only two of 20 that had not, were infested by *E. velutinana*. A test in 1954 showed that lead arsenate in the second and third cover sprays against *C. pomonella* at 3½ lb. per 100 gal. gave 91 per cent. mortality of first-generation larvae of *E. velutinana*, whereas 25 per cent. wettable DDT at 1 lb. gave only 59 per cent. The superiority of lead arsenate was largely due to its better control of the late-instar larvae present at the time of application, but growers reported DDT to be as effective as lead arsenate against early-instar larvae when applied in the calyx or first cover spray [cf. 37 434]. Natural enemies that contributed to control comprised several parasites, of which the most important were *Trichogramma minutum* Ril., *Itoplectis conquisitor* (Say), *Angitia* (*Horogenes*) *obliterata* (Cress.) and *Ephialtes* (*Iseropus*) sp., and the predators, *Chrysopa oculata chlorophana* Burm., *Podisus maculiventris* (Say) and *P. modestus* (Dall.). *T. minutum* destroyed averages of 3 per cent. of the first- and 35 per cent. of the second-generation eggs each year, and the other three parasites together destroyed averages of 8 and 5 per cent. of the first- and second-generation larvae, respectively. All the natural enemies were present in orchards in which DDT was not used, but they were exterminated where it was regularly applied. The outbreak therefore appears to be due to the relative ineffectiveness of DDT against the late-instar larvae and the reduced number of cover sprays now applied against *Cydia pomonella*, and in part to the destruction of natural enemies by DDT.

PARADIS (R. O.). **Quatre années d'observations bio-écologiques sur la tordeuse à bandes rouges, *Argyrotaenia velutinana* (Wlkr.) (Lépidoptères: Tortricidae), dans le sud-ouest du Québec.**—38th Rep. Quebec Soc. Prot. Pl. 1956 pp. 91-98, 5 refs. Quebec, 1957.

Observations on the bionomics of *Eulia* (*Argyrotaenia*) *velutinana* (Wlk.) were made in apple orchards in south-western Quebec [cf. preceding abstract] in 1952-55. Adults of the overwintered generation emerged in early May, when the mean daily temperatures reached 57-63°F. and the trees were at the green-bud or pre-pin' stage of development, and peak activity continued until 21st May. First-generation eggs were deposited

mostly during the last three weeks of May, when mean daily temperatures varied from 55 to 63°F., and the larvae hatched in 7–20 days, with an average of 12.5 days, mostly during the ten days following flowering. The larval and pupal stages lasted for averages of 32–42 and 8–11.5 days, respectively, and were shorter at high than at low temperatures. The adults usually emerged in July and were most abundant in the latter half of the month, but in 1955, when mean temperatures during June–August were 5–6°F. higher than usual, emergence began on 26th June. Most of the second-generation eggs were laid in the last half of July in 1952–54 and between 5th and 12th July in 1955, and they hatched in an average of ten days. The larval stage was mostly completed between August and mid-October and lasted 55–98 days. Pupation took place in October and November, and the pupae overwintered. In 1955, the unusually high temperatures caused about 5 per cent. of the larvae to pupate as early as the beginning of August, and these gave rise to adults between 15th and 25th August. Eggs deposited by the females produced third-generation larvae, which were present throughout September and October.

DUNCAN (J.) & COUTURE (R.). **Les pucerons de la pomme de terre dans l'est du Québec.**—38th Rep. Quebec Soc. Prot. Pl. 1956 pp. 49–55. Quebec, 1957.

Surveys of the aphids that infest potato in eastern Quebec were made in experimental plots in 1950–56. Counts in July–September showed that *Macrosiphum solanifolii* (Ashm.) comprised 54 per cent. of the total number present on leaf samples, and *Myzus persicae* (Sulz.) and *Aphis abbreviata* Patch 38.63 and 7.34 per cent., respectively. Two examples of *Macrosiphum* (*Myzus*) *solani* (Kalt.) were found in 1953. Numbers varied considerably from year to year, and they were very low in 1954, when the season was cold and wet, and 1955, when it was hot and dry. *Macrosiphum solanifolii* and *Myzus persicae* appeared to require similar conditions; *A. abbreviata* was the most abundant species in 1951, when the summer was cool and rainy, and *M. persicae* in 1952, when the nights were rather cold after mid-August. *Macrosiphum solanifolii* appeared on the plants towards mid-June, reached peak numbers during the second fortnight of August, and decreased rapidly at the beginning of September with the onset of cooler nights. *Myzus persicae* reached peak numbers a fortnight later than *Macrosiphum solanifolii* and continued to increase until the first frosts. Colonies of *A. abbreviata* began to develop at the beginning of August, and populations increased towards the end of the season and persisted as long as green food was available. More than half the aphids found occurred on leaves at the base of the plant, and the rest were equally divided between the middle and top. The percentage in each situation varied from year to year, and there was a tendency to move to the base in dry seasons. *M. solanifolii*, which shows marked preference for the inflorescences, was most frequent on leaves at a little above the base of the plants, and the other two species at the base. Alates, which are chiefly responsible for the dissemination of virus diseases, comprised only 2.25 per cent. of the total number of aphids. The percentage present each season did not vary greatly, except in *A. abbreviata*, and was less than 1 for *Myzus persicae* and between 3 and 4 for *Macrosiphum solanifolii*. Five parasites, of which *Aphidius nigripes* Ashm. and *Praon occidentalis* Baker were the most abundant, were collected during the investigation. Populations of parasites and aphids both reached their maxima towards the last week in August or the first in September, and both were greatest in 1953. The average percentage parasitism for the season varied from 3.18 in 1954 to 4.28 in 1955.

PARENT (B.). **Emploi de malathion pour la répression du pique-bouton du pommier, *Spilonota ocellana* (D. & S.), dans le Québec.**—*38th Rep. Quebec Soc. Prot. Pl.* 1956 pp. 56-61, 11 refs. Quebec, 1957.

Parathion applied to apple at bud-burst gives good control of *Spilonota ocellana* (Schiff.) in Quebec, but in view of the hazards to operators, the value of malathion was investigated in 1953-54. Wettable-powder sprays of 4 or 8 lb. 25 per cent. malathion or 4 lb. 15 per cent. parathion and an emulsion spray of 6 pints 50 per cent. malathion concentrate per 100 gal. applied on 28th July 1953, when 95 per cent. of the eggs had hatched and the mean temperature and the relative humidity were 69°F. and about 65 per cent., respectively, all reduced numbers of newly hatched larvae by over 80 per cent. in two days, but only the malathion emulsion spray, which gave 93.5 per cent. kill, was significantly superior to parathion, which gave 80.3 per cent. In 1954, emulsion sprays of 1 or 2 pints malathion concentrate and wetttable-powder sprays of 1 or 2 lb. 25 per cent. malathion or 1 lb. 15 per cent. parathion per 100 gal. applied on 18th May, when the overwintered larvae had left their hibernacula and the mean temperature and the relative humidity were 51°F. and about 80 per cent., respectively, all killed over 75 per cent. of the larvae in three days. The stronger malathion emulsion spray and the parathion spray were the most effective and gave 94.4 and 93.1 per cent. mortality, respectively.

MARSHALL (James). **Concentrate Spraying in deciduous Orchards.**—*Publ. Dep. Agric. Can.* no. 1020, 47 pp., 13 figs., 69 refs. Ottawa, 1958.

Concentrate, or low-volume, spraying has virtually replaced the high-volume method of spray application for the control of pests on fruit trees in British Columbia. The author reviews the history of concentrate spraying, the types of sprayers available, the effectiveness of the method and the associated risk of spray injury to the trees, factors affecting the efficiency of the sprayers, the coverage obtained, the value of surface-active adjuvants (surfactants) in the sprays and the risk of soil contamination by spray chemicals. Recommendations for the use of insecticides, acaricides, and fungicides in concentrated sprays under local conditions are included.

MCGUGAN (B. M.). **Forest Lepidoptera of Canada recorded by the Forest Insect Survey. Volume I. Papilionidae to Arctiidae.**—*Publ. Dep. Agric. Can.* no. 1034, [4+] 76 pp., 46 maps, 11 refs. Ottawa, 1958.

This first volume and those to be published in the same series are based on the work of the Forest Insect Survey, which was begun in eastern Canada in 1936 and subsequently extended to forest regions throughout the country. The information is arranged in a semi-tabular form under insect species, and concerns distribution, food-plants (with the number of records for each), type of feeding, prevalence, numbers of collections and of specimens received (arranged by years), and seasonal occurrence. Maps of distribution are included for as many species as the data available permit. No attempt is made to present a complete list of the Lepidoptera found on forest trees and shrubs in Canada, and emphasis is placed on species that reach outbreak numbers and trees that are of economic importance, but an effort has been made to record any noticeable insect damage. The present volume contains the information on 82 species in the families Papilionidae to Arctiidae, and is furnished with indexes to the insects and to the trees and shrubs concerned.

BLAIS (J. R.). **Some Relationships of the Spruce Budworm, *Choristoneura fumiferana* (Clem.) to Black Spruce, *Picea mariana* (Moench) Yoss.**—*For. Chron.* **33** no. 4 pp. 364–372, 1 graph, 3 refs. Toronto, 1957.

The three most important host trees of *Choristoneura fumiferana* (Clem.) in eastern Canada are balsam fir (*Abies balsamea*), white spruce (*Picea glauca*) and black spruce (*P. mariana*). The last is much more resistant to attack than either of the others, and this has been attributed to the late opening of the buds. Observations were made in Quebec on the relation of *C. fumiferana* to *P. mariana*, and the following is based on the author's abstract of the results. Larvae feeding on *P. mariana* had a lower rate of development and a higher rate of mortality than those feeding on *P. glauca* or *A. balsamea*. When staminate flowers were abundant on *P. mariana*, however, *C. fumiferana* survived and developed almost as well as on *P. glauca* and *A. balsamea*, the flowers providing adequate food for the third- and fourth-instar larvae and permitting survival until the buds opened. The relative immunity of *P. mariana* from severe attack is thus attributable to the late opening of the buds, which forces the larvae to feed on the inadequate food provided by old foliage and unopened buds, rather than to inferior nutritional quality of the foliage.

STARK (R. W.) & COOK (J. A.). **The Effects of Defoliation by the Lodgepole Needle Miner.**—*For. Sci.* **3** no. 4 pp. 376–396, 27 figs., 19 refs. Washington, D.C., 1957.

The following is based almost entirely on the authors' summary. *Recurvaria starki* Freeman [cf. *R.A.E.*, A **43** 303; **45** 479] caused as much as 80 per cent. defoliation of lodgepole pine [*Pinus contorta*] in Banff National Park, Alberta, during the recent outbreak [cf. **42** 27], but defoliation never became complete, except on a few over-mature trees. The greatest defoliation probably occurred in 1940–44. From 1945, there was a decrease varying in situation with differences in *Recurvaria* populations, until by 1956 maximum defoliation in any part of the outbreak area did not exceed 40 per cent. Terminal and lateral growth were significantly reduced by a defoliation of 40 per cent., with negligible reduction at 10 per cent. If the outbreak had continued at the earlier level, tree mortality would have occurred, probably by 1960.

A method is described whereby population estimates obtained by survey sampling [cf. **42** 27] are used to estimate within 10–20 per cent. the percentage defoliation, probable tree mortality, and approximate time at which tree mortality can be expected. The use of such a method in control or management requires a knowledge of the main features of the life-history of the insect and the sampling technique. Past history of defoliation can be deduced from the condition of the trees and the future defoliation estimated by the application of this method.

The growth of mature trees was analysed by a method isolating external growth influences and using samples comprising only two radial sections through single trunks. This enabled the time at which an increment-reducing agent had come into effect and the probable magnitude of the effect to be determined. The magnitude was determined from curves prepared by plotting the average width of each annual ring against the year of its formation for each of the two sections, of which one included rings formed during the period of attack and a corresponding period prior to it and the other section rings formed over an equivalent total period ending just prior to the attack. The two curves, which are termed, respectively, the "damage" and "base" curves, overlapped for about half the study period, thus establishing the normal relation, and the difference between them

indicated the magnitude of the disturbing influence. Analysis of many sections clearly showed a lag in the effect of defoliation on increment between the upper and lower bole, so that, for accurate determinations, samples should be taken from the portion of the bole within the crown.

SAGER (S. M.). **A Virus Disease of Western Hemlock Looper, *Lambdina fiscellaria lugubrosa* (Hulst) (Lepidoptera: Geometridae).**—*Canad. J. Microbiol.* **3** pp. 799–802, 1 pl., 6 refs. Ottawa, 1957.

A nuclear polyhedral disease was associated with the collapse of a serious outbreak of *Lambdina fiscellaria lugubrosa* (Hulst) on western hemlock [*Tsuga heterophylla*] on Vancouver Island in 1945–47 [cf. *R.A.E.*, A **34** 379], and infected larvae were also observed in Washington State [cf. **35** 51]. In view of its possible use in control, laboratory studies were made of the pathogenic agent. A suspension of polyhedra was prepared from laboratory-reared larvae that had died after ingesting a suspension of pulverised dried infected larvae, previously kept in store for 6–7 years, and was used in determining the characters and properties of the virus, which are described, and in observations on the symptoms, histopathology and incubation period of the disease. Larvae that ingested a large drop of the suspension and subsequently fed on contaminated foliage for 32 hours and then on uncontaminated foliage showed a reduction in feeding after 12 days, followed by complete cessation. Internal symptoms became apparent in the nuclei of the fat-body after six days and subsequently spread to the haemolymph, hypodermis and tracheal matrix, and 67 per cent. mortality resulted, in an average of 15.5 days. When the larvae were starved for 18–24 hours, given one drop of the suspension, and allowed to feed on uncontaminated foliage, 60 per cent. died, in an average of 11 days. There was no mortality in the controls.

REID (R. W.). **The Bark Beetle Complex associated with Lodgepole Pine Slash in Alberta. Part IV. Distribution, Population Densities, and Effects of several environmental Factors.**—*Canad. Ent.* **89** no. 10 pp. 437–447, 6 refs. Ottawa, 1957.

This fourth paper in a series [cf. *R.A.E.*, A **46** 333, etc.] contains an account of investigations on the infestation by Scolytids of the slash of newly cut trees in a stand of lodgepole pine (*Pinus contorta* var. *latifolia*), 80 years of age, on the east slope of the Rocky Mountains in Alberta and of the factors influencing the distribution of the beetles. Blocks of trees were cut according to five silvicultural systems during the autumn and winter of 1951–52, and populations in the slash were determined from counts of *Ips pini* (Say), which was the most important species present and the one most suitable for the purpose, during the spring, summer and autumn of 1952 and the spring of 1953. The following is based largely on the author's summary of the results.

Slash with a diameter of 4.5–4.9 in. (the largest available) was the most susceptible to attack by *I. pini*. The distribution of attack on slash within a single diameter class (3.5–3.9 in.) was tested for conformity with three empirical distributions and was found to be better described by Neyman's contagious distribution than by Poisson or negative-binomial distributions. Subcortical temperatures in slash subjected to direct solar radiation differed in aspects of the same piece of slash and in the same aspects of ground and aerial slash. Adults of *I. pini* more commonly attacked portions of exposed slash that were least subjected to direct radiation. Attacks were distributed evenly over single pieces of slash shaded from direct radiation. Subcortical temperatures of shaded slash were slightly lower than air temperatures.

The direction in which the main axis of the slash lay did not affect its susceptibility to attack. In exposed situations, slash having rough scaly bark was more susceptible than slash having smooth bark with few curled scales, but this relation was not apparent in slash shaded from direct radiation. Large volumes of slash attracted about the same numbers of adults of *I. pini*, regardless of their degree of exposure. Summer mortality among the immature stages was attributed to high subcortical temperatures in exposed slash, in which parasites and predators were relatively scarce, and to the action of natural enemies in shaded slash. The population that survived the winter of 1952-53 was considerably larger than that present prior to felling, but was too low to constitute a hazard to the remaining trees.

From a consideration of the effects of the cutting systems, it is concluded that, in stands similar to that studied, trees with diameters of up to 6.5 in. can be felled without producing sufficient susceptible slash to constitute a serious hazard. Clear cutting and other treatments resulting in large volumes of slash are attended by the greatest risk, since attack is most frequent in unexposed slash, mortality from solar radiation is low in it and the environment does not favour natural enemies. Where selective felling results in large volumes of slash in a shaded environment, high Scolytid populations develop, but since conditions also favour natural enemies, the hazard to the remaining trees is reduced.

RANDALL (A. P.). **Plastic Rearing Cage for maintaining fresh Conifer Foliage for Insect Rearing.**—*Canad. Ent.* 89 no. 10 pp. 448-449, 1 fig. Ottawa, 1957.

The mass rearing of larvae of *Acleris variana* (Fern.) in Canada was hampered because twigs of hemlock (*Tsuga heterophylla*) or balsam fir (*Abies balsamea*) bearing overwintering eggs shed their leaves within a few days when brought into the laboratory. The difficulty was overcome by keeping them in rigid, transparent plastic boxes with tightly fitting covers and overall dimensions of $6\frac{1}{4} \times 3 \times 1\frac{1}{2}$ in. in which aeration holes were made and covered with screening; the boxes were placed on end on a plastic baffle in a metal trough, and the cut stems passed through holes in the boxes into water, or an auxin or nutrient solution. The humidity in the cages could be varied by altering the size of the openings. Advantages of the apparatus are its compactness, the reduced risk of contamination between cages, and the ease with which the contents can be inspected without disturbing them or adjacent material. Hemlock twigs retained their leaves for up to six weeks, and the cages were also used successfully for twigs of balsam fir and other conifers.

WISHART (G.). **Surveys of Parasites of *Hylemyia* spp. (Diptera: Anthomyiidae) that attack Cruciferous Crops in Canada.**—*Canad. Ent.* 89 no. 10 pp. 450-454, 9 refs. Ottawa, 1957.

Surveys of the parasites of species of *Hylemyia* that attack cruciferous crops were made in Canada in 1951-53 in connection with investigations on biological control [cf. *R.A.E.*, A 42 367; 43 434]. The principal pest species involved were *H. brassicae* (Beh.), *H. floralis* (Fall.) and *H. planipalpis* (Stein), but *H. cilicrura* (Rond.) was often associated with them [cf. 39 433]. Early observations showed that there were no egg parasites and that parasites that attacked the larvae emerged from the puparia, and the work was therefore based on collections of puparia made throughout the country and subsequently reared in the laboratory. Of the three most abundant natural enemies obtained, the Staphylinid, *Aleochara bilineata* Gylh., and the Cynipid, *Trybliographa rapae* (Westw.), occurred throughout Canada and attacked all four host species, and *A. bipustulata* (L.) was found in several

areas, though usually only in small numbers; occasional examples of an Ichneumonid and a Braconid were also obtained. The numbers of puparia collected, the percentages represented by the different hosts, and the percentages of each host attacked by the various species are shown for all the localities in tables. The figures for the Staphylinids were probably too low, since both attack the pupae and the proportion found attacked depends on the age of the puparia when collected, which could not be determined. *A. bilineata* and *T. rapae* varied considerably in abundance at different localities. The percentage parasitism by *T. rapae* in *H. floralis* varied from 0.2 to 0.3, whereas in *H. brassicae* the range was from 0.4 to 46.3. In Europe, where both hosts occur in the same districts at different seasons, attack on *H. floralis* equals or exceeds that on *H. brassicae* because high populations that develop on the latter in spring are available to attack the larvae of *H. floralis* when they appear later in the season. *H. brassicae* does not occur in Manitoba and Saskatchewan, and though *H. planipalpis* appears there early in the season, it is not abundant enough to enable high populations of *T. rapae* to develop. M. J. Sanderson found that examples of *Aleochara* reared from *H. brassicae* in Illinois in 1938 or 1939 and thought to be *A. bimaculata* Grav. are referable to *A. bilineata*, and it is thought that most, if not all, records by earlier investigators of Staphylinids attacking *H. brassicae* in North America probably refer to this species. *A. bipustulata* attacked *H. cilicrura* more commonly than *H. brassicae*. Its bionomics are similar to those of *A. bilineata*, but the larvae have difficulty in entering large or thick-skinned puparia of *H. brassicae*, and *H. floralis*, which is the largest of the host species, is rarely attacked.

TURNOCK (W. J.). **A Trap for Insects emerging from the Soil.**—*Canad. Ent.* **89** no. 10 pp. 455–456, 2 figs. Ottawa, 1957.

The trap described was devised in the course of studies in Canada on the emergence of adults of *Pristiphora erichsonii* (Htg.) from the soil beneath larch trees and is wired into the top of a pyramidal screen cage attached to a basal wooden frame covering an area of 2 sq. ft. It is constructed from a round plastic container, with the bottom removed, a hole cut in the double sealing cover and closed with copper screening, and the sides painted black. An 8-oz. styrene funnel from which the shaft is removed is fixed inside the container with its wide end level with the base, the inner side of the container and the upper surface of the funnel are coated with an adhesive, and the lower surface of the funnel is roughened. Insects emerging from the soil move upwards through the funnel, attracted by the light entering through the lid, and are retained by the adhesive. The traps were visited every four days, and, in laboratory tests of their efficiency, 90–95 per cent. of 190 adults of *P. erichsonii* placed in the cages in groups of 20–40 were recovered in the traps.

AUCLAIR (J. L.), MALTAIS (J. B.) & CARTIER (J. J.). **Factors in Resistance of Peas to the Pea Aphid, *Acyrtosiphon pisum* (Harr.) (Homoptera: Aphididae). II. Amino Acids.**—*Canad. Ent.* **89** no. 10 pp. 457–464, 29 refs. Ottawa, 1957.

The following is substantially the authors' summary of this second part of a series [cf. *R.A.E.*, A **46** 484]. Quantitative data on the contents of amino acids of pea plants of three varieties that are susceptible and three that are resistant to infestation by *Macrosiphum* (*Acyrtosiphon*) *pisum* (Harris) in Quebec were obtained by paper chromatography. The susceptible varieties generally contained a higher concentration of free and total amino

acids than the resistant ones at the stages of growth corresponding with the period of aphid infestation in the field. It is suggested that the lower concentration of amino acids in the resistant varieties reduces the rate of aphid growth and reproduction and therefore contributes to the resistance of these varieties.

JACOBSON (L. A.) & BLAKELEY (P. E.). **Effects of Moisture during Starvation of Larvae of the Pale Western Cutworm, *Agrotis orthogonia* Morr. (Lepidoptera: Phalaenidae).**—*Canad. Ent.* **89** no. 10 pp. 465-469, 1 graph, 9 refs. Ottawa, 1957.

Larvae of *Agrotis orthogonia* Morr. move and feed usually at the interface between dry and moist soil and can absorb moisture both from the soil and from the plants on which they feed. The effects of moisture on starving larvae were investigated in the laboratory [cf. also *R.A.E.*, A **41** 426], and the following is based largely on the authors' summary of the results. When larvae in the second and fourth instars were starved at 25°C. [77°F.] and relative humidities of about 5, 53 and 97 per cent., those in the second instar survived for rather more than 9½ days at the medium humidity and for about 8½-9 days at the two others, whereas the fourth-instar larvae survived for almost 17½ days at the medium humidity and for about 16 days at the other two. Loss in weight during starvation was mostly due to loss of water, since loss in dry weight after starvation was the same for all humidities, whereas water loss varied inversely with relative humidity.

BRONSKILL (J. F.) & HOUSE (H. L.). **Notes on rearing a pupal Endoparasite, *Pimpla turionellae* (L.) (Hymenoptera: Ichneumonidae), on unnatural Food.**—*Canad. Ent.* **89** no. 10 p. 483, 2 refs. Ottawa, 1957.

Following the observation that eggs of *Pimpla turionellae* (L.) would develop and hatch in physiological saline solution, larvae of this Ichneumonid endoparasite were successfully reared in the laboratory on a medium consisting of equal parts by weight of pork liver (preferably cooked) and 0.8 per cent. saline solution that was homogenised, autoclaved at a pressure of 15 lb. for 15 minutes and, when cool, transformed into a thick watery mixture under sterile conditions. Embryos of *P. turionellae* dissected from pupae of *Galleria mellonella* (L.) were confined singly in sterile test-tubes each containing 2 ml. medium after being dipped momentarily into a solution of mercuric chloride and rinsed four times in sterile saline. They were kept in darkness at 23°C. [73.4°F.] and about 72 per cent. relative humidity until mature, when they were transferred singly to gelatin capsules that were lined with blotting paper and punctured for ventilation, in which they completed their development. The larvae appeared within a few hours of introduction of the embryos into the tubes, and 147, ten of which ultimately gave rise to adults, were obtained from 152 embryos. Mortality occurred throughout larval and prepupal development, and survival was highest among larvae that remained on the surface of the medium. An adult female reared by this method lived for more than three months and produced viable offspring.

DAVIS (G. R. F.). **Growth and Feeding Behavior of Larvae of *Ctenicera aeripennis destructor* (Brown) (Coleoptera: Elateridae). I. Effects of Carrot Slices and Seeds of Wheat, Flax, Barley, Rye, and Alfalfa.**—*Ann. ent. Soc. Amer.* **50** no. 6 pp. 578-581, 4 refs. Washington, D.C., 1957.

The following is based on the author's summary. Medium-sized and large larvae of *Ctenicera aeripennis destructor* (Brown), under and over 20 mg. in

weight, respectively, were collected in the field in Saskatchewan and reared for 30 weeks in the laboratory on carrot slices and on seeds of wheat, flax, barley, rye and lucerne, provided separately and in combination and renewed weekly. The weekly records showed that a greater percentage fed on rye, carrot or wheat than on flax, barley, lucerne or a combination of all six foods. When given a choice of the six foods, the larvae fed more frequently on carrot, rye or wheat or on some combination of the three than on any other foods. They attacked one food as frequently as several, but did not feed on a particular food to the exclusion of others, thus effecting a mixed diet. The diet influenced the number of larvae that fed during the week before, the week after and the week of moulting.

Individuals varied greatly in weight gained, and the gain was independent of the number of moults and of the incidence of feeding. They fed and lost weight, gained weight without feeding, and moulted and gained weight without feeding. Ecdysis did not always indicate a change to a more mature form of larva. Carrot and wheat alone or in combination with the other foods caused large increases in weight. Rye was a poor food when supplied alone, but did not affect the larvae adversely in combination with carrot and wheat. Survival of medium-sized larvae was unaffected by the mixed diet. However, large larvae survived better on it than on wheat, flax, barley, rye or carrot.

Although other workers found that monocotyledons were superior to dicotyledons as food for this and other wireworms [*R.A.E.*, A 27 540; 31 26], the results obtained show that dicotyledons satisfied the food requirements of larvae of *C. a. destructor* as well as monocotyledons. No evidence was obtained to suggest that feeding on germinating wheat seeds induced diapause in the larvae [*cf.* 40 250].

FROST (S. W.) & PEPPER (J. O.). **Aphids attracted to Light Traps.**—*Ann. ent. Soc. Amer.* 50 no. 6 pp. 581–583, 6 refs. Washington, D.C., 1957.

Broadbent was the first to point out that aphids fly throughout the night and are attracted to light [*R.A.E.*, A 37 31], but he did not indicate the species concerned. In the work here reported, two light-traps hung about 6 ft. above the ground were operated during the summers of 1953–56 in a small area in State College, Pennsylvania. Various types of traps and lamps were tried, but white tungsten-filament and ultraviolet fluorescent lamps of about the same intensity were used most of the time. Numerous aphids were attracted, more to the ultraviolet than to the white light, and nearly 4,400 individuals were identified. They represented 55 species, and lists of them are given, with full collection data for the 24 most numerous. Catches were greatest in May–June and September–October, and there were considerable differences in the response of individual species. The species most frequently taken was *Macrosiphum avenae* (F.) (*granarium* (Kby.)), although this aphid is not commonly observed in Pennsylvania and there were no grain fields in the vicinity. Some other relatively uncommon species were also taken, but the catches of some of the common ones were low.

ALLEN (H. W.) & PLASKET (E. L.). **Populations of the Oriental Fruit Moth in Peach and Apple Orchards in the Eastern States.**—*Tech. Bull. U.S. Dep. Agric.* no. 1182, [1+] 13 pp., 8 refs. Washington, D.C., 1958.

The following is based on the authors' summary. During a prolonged study of the value of parasites and insecticides for the control of *Cydia* (*Grapholitha*) *molesta* (Busck) in the eastern United States [*cf.* *R.A.E.*, A 47 63], numerous data on the population density of the moth were collected,

and those obtained in 1939-40 and 1952-54 are presented to show the status of infestations before and after effective insecticides were available for control. Counts in bearing peach orchards in New Jersey in 1939-40 showed averages of 14 and 14.3 twig-infesting first- and second-generation larvae and 194 third-generation larvae in the fruits at harvest per tree, but the corresponding numbers were only 1, 4 and 5 per cent. as great, respectively, in well sprayed orchards in 1952-54. Despite this reduction in population, moderate or heavy infestation continued in young unsprayed peach orchards and in neglected unsprayed apple orchards, both of which are common near sprayed peach orchards. In young unsprayed peach orchards in Burlington County, limited observations indicated that about 15 and 19 times as many first- and second-generation larvae were produced per tree as in bearing sprayed orchards, but despite these large differences, the average number of first-generation larvae on the young trees was only 2.1 per tree; the average for the second generation in New York and New Jersey was 11.5.

Observations in unsprayed apple orchards made in 1952-54 in an area extending from eastern Connecticut to northern North Carolina showed that moderate or heavy infestation generally occurred from the time of the second generation until the end of the season. Unsprayed apple appeared to be the source of most of the adults that emerged from August onwards; the numbers reared per 1,000 fruits ranged from few or none to 424 for the second generation, 435 for the third generation and 1,357 for the overwintering generation. Many single apple trees produced far more larvae than did several acres of well sprayed peach.

Bearing peach orchards that received no insecticides against the moth continued to be nearly as heavily infested as before effective sprays were available, but they constituted only a comparatively small acreage. Very late peaches are now little grown, and no longer contribute much to the overwintering population.

QUESTEL (D. D.) & GENUNG (W. G.). **Establishment of the Parasite *Anagyrus antoninae* in Florida for Control of Rhodesgrass Scale.**—*Florida Ent.* **40** no. 4 pp. 123-125, 3 refs. Gainesville, Fla., 1957.

Antonina graminis (Mask.), which attacks various pasture and lawn grasses and was first reported in the United States from southern Texas in 1942 [*cf. R.A.E.*, A **38** 493], had spread to 21 counties in Texas, one parish in Louisiana and three counties in Florida by 1950. It is now widespread in southern and central Florida, and *Anagyrus antoninae* Timb. was introduced from Texas [*cf.* **40** 288] in 1954 for its control. A consignment of 800 adults was liberated in July near Clewiston, and subsequent releases were made by distributing stems of grasses bearing parasitised scales in infested pastures. The parasite became established, and a survey in the summer of 1956 showed that it had spread for up to 7½ miles from the release points. It also became established on ranches in widely separated areas on which it was released in late 1956 and early 1957. The scale is now found only with difficulty in the original liberation area.

LINCOLN (C.) & LEIGH (T. F.). **Timing of Insecticide Applications for Cotton Insect Control.**—*Bull. Ark. agric. Exp. Sta.* no. 588, 47 pp., 1 graph, 26 refs. Fayetteville, Ark., 1957.

The following is substantially the authors' summary of the results of the investigations described, which were carried out in Arkansas between 1947 and 1956. Applications of insecticides for the control of *Anthonomus grandis* Boh. greatly increase the yield of cotton when infestations are heavy and conditions are favourable for the fruiting of the plants, but not when

infestation is low or conditions unfavourable. Treatments applied so as to reduce the seasonal average infestation to not more than 40 per cent. punctured squares maintained yields and cost less than more frequent applications. Infestations of *A. grandis* are frequently heavy on hill land early in the season and the fruiting period short, so that control measures are needed as soon as squares appear, but only limited treatments are economically justifiable.

Good scouting and good judgment are essential in the control of *Heliothis zea* (Boddie) and *H. virescens* (F.). In order to give predators full opportunity to control an incipient outbreak of these bollworms, insecticides should not be applied while the infestation is confined to eggs and small larvae in the terminals, but if larger larvae develop and feeding on the squares begins, insecticides should be promptly applied. DDT at 0.5 lb. per acre in dust or spray, applied at weekly intervals, is usually effective in controlling moderate infestations of small larvae, but increased dosages and applications at five-day intervals are necessary when infestations are heavy and large larvae present.

Control of *Frankliniella fusca* (Hinds) rarely improves earliness of crop, total yield or stand, though better early growth is frequently obtained. Seed treatment with Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] controlled the thrips throughout the period of heavy infestation, but frequently reduced the stands and sometimes slightly reduced plant growth. Similar treatment with Bayer 19639 [O,O-diethyl S-2-(ethylthio)ethyl phosphorodithioate] gave promising results. *Psallus seriatus* (Reut.), *Lygus lineolaris* (P. de B.) and *Adelphocoris rapidus* (Say) are of little consequence on cotton in Arkansas and rarely require control, no important gains in yield or earliness resulting from control of a persistent infestation of *P. seriatus* well in excess of the population level (40 examples per 100 terminals) at which control is ordinarily recommended.

Adequate control of Tetranychid mites is difficult to obtain with a single application of any acaricide in the absence of predators or heavy rain. Outbreaks usually occur when the predators have been killed by early- and mid-season applications of insecticides, and applications should therefore be delayed until August if possible. The persistence of the predators on cotton depends on the availability of prey to encourage reproduction, continued immigration from other plants, and the way in which insecticides are used.

OSGOOD jr. (E. A.). **A Bibliography on the Southern Pine Beetle *Dendroctonus frontalis* Zimm.**—*Sta. Pap. S.-E. For. Exp. Sta.* no. 80, 19 pp. Asheville, N. C., 1957.

Dendroctonus frontalis Zimm., which is native to the United States, occurs from southern Pennsylvania southward to northern Florida and westward to eastern Texas and Oklahoma and is one of the most important insect pests of the pine trees that grow in that area. The many references to it scattered in the literature up to the end of 1956 are here brought together in alphabetical order of authors, and selected ones classified by numbers under various headings.

GUYER (G.), MOROFSKY (W. F.) & LEMMIEN (W.). **The Evaluation of Insecticides for Control of the European Pine Shoot Moth under Spring and Summer Conditions.**—*Quart. Bull. Mich. agric. Exp. Sta.* 39 no. 3 pp. 432-437, 5 refs. East Lansing, Mich., 1957.

An account is given of further field experiments on the control of *Rhyacionia buoliana* (Schiff.) [cf. *R.A.E.*, A 46 259] on young trees of red pine (2922) 3/59 [A]

(*Pinus resinosa*) in Michigan in 1956, in which the value of spring and summer applications of sprays was investigated and additional insecticides tested. The spring applications were made on 24th April, when the overwintered larvae were moving from bud to bud, and the sprays contained, per 100 U.S. gal., DDT at 2 lb. in a wettable powder and at 2 and 3 lb. in emulsion concentrates, Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] at 1 lb., DDT combined with Thimet at 2 and 1 lb., respectively, endrin or Systox [diethyl 2-(ethylthio)ethyl phosphorothioate (demeton)] at 0.5 lb., and parathion, diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate], Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] and Dow ET-15 [O-methyl O-2,4,5-trichlorophenyl phosphoramidothioate] at 0.33 lb. in emulsion concentrates, and water-soluble Phosdrin [dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate] at 1 lb. Counts of the larvae and pupae in the shoots on 7th June showed that DDT was the most effective and that only the emulsion sprays of this material, alone or with Thimet, gave significant control. The same materials were tested in summer, applications being made on 22nd June, when the first-generation larvae were hatching; in addition, a second application of DDT at 2 lb. in an emulsion spray was made to a block of trees sprayed with this material in spring, and one of the blocks sprayed with it for the first time in summer received a second application ten days later. Counts of the newly hatched larvae in shoots from all the experimental trees were made on 18th September. None of the spring applications afforded any control. DDT was the most effective of the insecticides applied in summer and, at similar concentrations, was as effective in a wettable powder as in an emulsion concentrate. Two summer applications of DDT were more effective than one and gave complete control. Guthion and parathion were almost as effective as DDT, and Phosdrin and Dow ET-15 also gave significant control. It is concluded that DDT is the most satisfactory and economical material for use against *R. buoliana*. Summer sprays control larvae in the first four instars, but a second application may be necessary if infestation is heavy and the adults active for more than four weeks. Spring treatment may best be confined to plantations in which summer sprays were unsatisfactory or omitted in the previous year. Correct timing of the sprays is important, and failure in control is often attributable to insufficient coverage; both high- and low-volume equipment was satisfactory in the present and similar investigations.

GUAGLIUMI (P.). *Automeris illustris* Wlk., (Lepid. Saturniidae), una nueva plaga de la caña de azúcar en Venezuela. [*A. illustris*, a new Pest of Sugar-cane in Venezuela.]—*Agron. trop.* 7 no. 3 pp. 151–157, 3 figs. Maracay, 1957. (With a Summary in English.)

An outbreak of *Automeris illustris* (Wlk.) occurred on a sugar-cane estate in Yaracuy in October 1957. This Saturniid had only twice previously been recorded on sugar-cane in Venezuela, but is known to attack other graminaceous plants there, including sorghum and maize. The larvae fed voraciously on the leaves, which they sometimes completely destroyed, leaving only the main veins, and as they have urticating hairs and secrete an irritating liquid from them when disturbed, they are annoying to workers. The larval and prepupal stages lasted at least 20 and 3 days, respectively, and the pupal stage, which was passed in a cocoon spun between leaf fragments or adjacent leaves, 15–18 days. About 20 per cent. of the larvae were parasitised by the Tachinid, *Stomatomyia edwardsii* (Will.), and one was found to be parasitised by unidentified Hymenoptera.

MALAGUTI (G.) & ANGELES (N.). **Ensayos preliminares sobre el uso de insecticidas en el control de los vectores de la "hoja blanca" del arroz.** [Preliminary Tests on the Use of Insecticides in the Control of the Vectors of Hoja Blanca of Rice.]—*Agron. trop.* 7 no. 3 pp. 161-163, 2 refs. Maracay, 1957. (With a Summary in English.)

In tests on the control of the unidentified Cicadellids that transmit the hoja blanca or white-leaf disease of rice in Venezuela [*cf. R.A.E.*, A 46 453; 47 31], Thimet [O,O-diethyl S-ethylthiomethyl phosphorodithioate] was applied at 5 per cent. by weight to the seed before sowing, the same treatment was followed by a spray of Metasystox [dimethyl 2-(ethylthio)ethyl phosphorothioate (methyl-demeton)] at 500 cc. per ha. applied a month after the rice had germinated, and the same methyl-demeton spray and one of endrin at 2 litres per ha. were applied 15 and 45 days after the germination of untreated seed. Each treatment was applied to three small plots. The total numbers of infected plants in the three plots and (in brackets) the total numbers of Cicadellid adults and nymphs were 61 (100 and 0), 53 (119 and 2), 81 (127 and 0), and 170 (197 and 36), as compared with 214 (247 and 18) for no treatment.

In a further test, sprays of methyl-demeton and Metaisosystox [O,O-dimethyl S-2-(ethylthio)ethyl phosphorothioate (methyl-demeton-S)] were applied to plots in a commercial planting by aeroplane 20, 50 and 78 days after germination, between October and December 1957. The average percentage of plants infected was reduced from 22.56 for no treatment to 7.87 and 3.68, respectively, the total yield was increased by about 50 per cent. and the weight of grain per bag was increased by about 10 per cent., owing to a decrease in the number of empty grains.

PUZZI (D.) & ORLANDO (A.). **Uma nova substância atrativa à *Ceratitis capitata* (Wied.) para emprêgo nas pulverizações de iscas envenenadas.** [A new Substance attractive to *C. capitata* for Use in poisoned Bait-sprays.]—*Biológico* 23 no. 9 pp. 181-184, 3 refs. São Paulo, 1957. (With a Summary in English.)

PUZZI (D.), ORLANDO (A.) & RIBAS (W. C.). **O emprêgo dos frascos "caçamoscas" no combate às "moscas das frutas".** [The Use of Trap-jars in the Control of Fruit-flies.]—*T. c.* no. 10 pp. 189-196, 1 col. pl., 1 fig., 5 refs.

Details are given in these two papers of experiments in São Paulo showing that a hydrolysate of maize steep liquor is an excellent attractant for adults of *Ceratitis capitata* (Wied.) and that trap-jars containing a 7 per cent. solution of brown sugar are insufficient for control, although large numbers of adults are taken in them [*cf. R.A.E.*, A 47 72].

DE FIGUEIREDO jr. (E. R.). **O controle do "caruncho" das tulhas.** [The Control of *Araecerus fasciculatus*.]—*Biológico* 23 no. 10 pp. 197-200, 2 figs. São Paulo, 1957.

Araecerus fasciculatus (Deg.) has become an important pest of stored coffee in Brazil, where development from egg to adult is completed in 30-45 days, there are 8-10 generations a year, and losses amount to 30 per cent. during a storage period of six months. Infestation is widespread in Santos, and both there and in São Paulo itself all infested lots are fumigated with methyl bromide, either in fumigation chambers or under gas-proof paper.

which gives effective control. The spread of the Anthribid would be reduced if the coffee could be treated at the points of origin of the infestation, in the interior of the country, but its distribution there is unknown.

McPHEE (J. R.). **Toxicity of Lithium Salts to Keratin-digesting Insect Larvae.**—*Nature* 180 no. 4593 pp. 1001–1002, 4 refs. London, 1957.

Elements that form insoluble sulphides are rendered harmless in larvae of *Tincola bisselliella* (Humm.) that have ingested them by conversion to these sulphides, which are excreted or deposited in the gut wall [cf. *R.A.E.*, A 42 139], but metals, such as lithium, that form soluble sulphides and are not normal constituents of tissues, and possibly others, such as barium and strontium, of which the sulphides decompose into soluble hydroxides, may be toxic. In experiments, active larvae, 21 days old, all died in 6–7 days when transferred to fabrics containing 0.2 g.-ion of lithium, strontium or barium per 10 kg. wool (0.1–0.5 per cent. by weight of their salts), and the larvae consumed only 0.2–0.4 mg. wool each, whereas a control larva consumed 2 mg. untreated wool in seven days. Salts of these three metals also protect wool from larvae of *Anthrenus flavipes* Lec., though the mechanism of detoxification differs from that in *T. bisselliella*. Ferrous iron, copper and nickel (all as sulphates), mercury, cadmium and lead (as acetates), silver (as nitrate), cobalt (as chloride) and antimony (as potassium antimony tartrate), all of which form insoluble sulphides, caused 70–90 per cent. mortality in 14 days among larvae of *T. bisselliella* that fed on wool treated with them at a rate of 1 g.-ion per 10 kg., but larval feeding during this period resulted in serious damage to the fabric. When tested at 1.5 g.-ion per 10 kg. wool, mercury, silver and antimony prevented visible damage, but the other metals did not. Magnesium and trivalent chromium (as sulphates), aluminium (as potassium aluminium sulphate) and calcium (as lactate and chloride) at 1 g.-ion per 10 kg. wool and sodium and potassium (as chlorides and sulphates and the latter also as the tartrate) at up to 5 g.-ion per 10 kg. wool did not affect larval development; aluminium and chromium and, possibly, magnesium, are probably excreted as insoluble hydroxides. Bromides and iodides of sodium and potassium were toxic to the larvae at 2 but not at 1.5 g.-ion per 10 kg. wool, and those of lithium, strontium and barium were more toxic at the same molar concentrations than the corresponding sulphates, chlorides or acetates. Bromides and iodides of cadmium, magnesium and aluminium, however, were toxic at 1–1.5 g.-ion, and the bromine and iodine concentration is then 0.5 g.-ion per 10 kg., which had little effect when these were combined with sodium or potassium.

BERGOLD (G. H.) & FLASCHENTRÄGER (B.). **The Polyhedral Virus of *Prodenia litura* (Fabr.) (Lepidoptera: Noctuidae).**—*Nature* 180 no. 4594 pp. 1046–1047, 2 figs., 8 refs. London, 1957.

A polyhedral virus disease attacks *Prodenia litura* (F.) in Egypt [cf. *R.A.E.*, A 46 27], Indo-China [cf. 26 205] and Europe, is frequent during outbreaks of this Noctuid in Egypt and causes heavy mortality among laboratory stocks there. The causal agent was investigated in Canada in connection with its possible use in control. The characters and properties of the virus, which are described, were determined from examination of material derived from dead larvae exhibiting typical symptoms that had been collected on cotton in Egypt in the autumn of 1956 and dried in a desiccator before shipment. The virus was found to be typical of the

Borrelina group, and the name *B. litura* is proposed for it. It was not possible to determine whether the disease is of the nuclear or protoplasmic type, but it is probably a typical nuclear polyhedrosis.

SWIRSKI (E.) & AMITAI (S.). **Techniques for breeding the Citrus Rust Mite** (*Phyllocoptruta oleivora* Ashm. Acarina Eriophyidae).—*Bull. Res. Coun. Israel* (B) 6 no. 3-4 pp. 251-252, 1 fig., 2 refs. Jerusalem, 1957.

Phyllocoptruta oleivora (Ashm.) has of recent years become one of the most injurious pests of *Citrus* in Israel, but little is known of its bionomics there, because of the difficulty of rearing the mites, which are very small, in the laboratory. They survive for only a short time on picked fruits, and wrapping the latter in plastic materials to keep them fresh gave inconsistent results. More favourable conditions were provided by planting twigs or small branches bearing leaves and fruits in pots or boxes of sand. The twigs were soaked in a hormone solution and then rinsed and planted on the following day. They rooted well, in about 20 days, in May, but had to be covered with bell-jars to prevent the leaves from wilting as a result of evaporation. Covering the fruits with punctured tins proved satisfactory, but covering the leaves with plastic did not. Celluloid cells were attached to the fruits, and rearing was begun with the eggs. In some cases, several generations were reared on a single fruit.

KOCKUM (S.). **Control of Insects attacking Maize on the Cob in Crib Stores**.—*E. Afr. agric. J.* 23 no. 4 pp. 275-279, 3 refs. Nairobi, 1958.

Maize grown in Kenya is husked and then stored on the cob for 6-8 months or longer to allow it to dry, and infestation by insects [*cf. R.A.E.*, A 44 68], which begins in the field, increases during this period unless protective measures are taken. Investigations in 1952 showed that the average percentage loss of weight in six untreated farm cribs in different districts amounted to 9.6 after four months and 23.1 after six. *Calandra oryzae* (L.) and *Sitotroga cerealella* (Ol.) infest the crop in the field but increase mainly in the stored grain, and they spread from the latter to adjoining fields of maize or other cereals. Since the development of suitable insecticide treatments in 1952-53 [*cf. loc. cit.*], about 10 per cent. of the total crop has been treated. The financial gain has been great, and reports from some growers indicate that the spread of *Calandra* from the stored grain has already been interrupted, the weevil having disappeared from their fields. Control was still not satisfactory when the maize had to be stored for prolonged periods, however, since the insecticide deteriorated on the outside cobs, owing to the effects of the weather, and left them exposed to infestation. Further tests were therefore made, in two cribs 36 × 9 × 9 ft. in size, having corrugated iron roofs and wooden floors raised from the ground. The sides were of open wire netting, and this was also used to divide each crib internally into 12 compartments each capable of holding 243 cu. ft. of maize. The tests are described in detail, and the following is based on the author's summary of the results.

Excellent insect control was afforded for six months by dusting the maize with 0.5 per cent. γ BHC in diatomite at a rate of 8 oz. dust per 9 cu. ft. of cobs (equivalent to 12.5 parts γ BHC per million), but protection was unsatisfactory after 13 months. No improvement was achieved by halving the amount of diluent and doubling its BHC content, dusting the exposed surface of the maize once or twice with pyrethrum powder (1.26 per cent. pyrethrin content) or lining the walls of the crib with grass, grass thatch or hessian cloth, but virtually complete protection for 13 months was given

by dusting the maize with 0.06 per cent. γ BHC at 8 oz. dust per 9 cu. ft. and surrounding the crib with a wall of hessian treated with a solution of 40 g. γ BHC and 4 g. coumarone indene resin in 1 litre kerosene per 100 sq. ft. No more BHC is used than in the original treatment. The resin reduces the rate of vaporisation of the BHC, and the presence of a slowly evolving gas barrier round the treated grain possibly prevents the dust on it from deteriorating.

MAITAI (W. M.). **Annotated List of Insects associated with the Sweet Potato** (*Ipomoea batatas*).—*E. Afr. agric. J.* **23** no. 4 pp. 290–291. Nairobi, 1958.

This annotated list of 27 species of phytophagous insects, 14 insect parasites and hyperparasites and two predators associated with sweet potato in Kenya is based on observations made at Ruiru between December 1954 and June 1955. Of the pests, the most important are *Cylas puncticollis* Boh., of which the adults feed on the leaves and the softer parts of the stems and the larvae bore in the stems and tubers, *Alcidodes* spp., of which the adults feed on the growing points, the soft parts of the stems and the bark and the larvae bore in the stems, Cassidids, notably *Conchyloctenia* (*Aspidomorpha*) *punctata parummaculata* (Boh.), of which the larvae and adults feed on the leaves, and *Herse convolvuli* (L.), of which the larvae occasionally defoliate the plants. The eggs of *C. punctata parummaculata* are parasitised by *Aprostocetus aspidomorphae* Ferrière, and the larvae of *H. convolvuli* by *Sturmia atropivora* R.-D.

RAINEY (R. C.). **Some Observations on flying Locusts and atmospheric Turbulence in eastern Africa**.—*Quart. J. R. met. Soc.* **84** no. 362 pp. 334–354, 2 pls., 6 graphs, 44 refs. London, 1958.

This paper is based mainly on observations made in Somaliland, Kenya and Tanganyika, and the locust swarms concerned consisted usually of sexually immature adults of *Schistocerca gregaria* (Forsk.). The following is virtually the author's summary.

Flying swarms were observed to vary in vertical extent from a few metres to several thousand metres, with the spacing of the locusts in them ranging from more than 10 to about 0.001 per cu. m. Some characteristic effects seen, from ground and air, are described in qualitative terms. Two well-documented records of flying locusts in numbers at some 2,000 m. above ground were both associated with lapse rates close to the dry adiabatic, from the ground up to at least the level of these locusts. On two other occasions, detailed observations of vertical temperature distribution were made in the immediate vicinity of large swarms flying up to 1,100–1,700 m. above ground, and in both these cases the topmost locusts were within 150 m. of the upper limit of superadiabatic or adiabatic lapse rates from the surface. Comparable observations on a swarm in which all flying locusts were below 6 m. demonstrated isothermal conditions, with the air temperature at 50 m. within 0.5°F. of that at the surface. All adequately documented records of swarm displacement so far available have been directly downwind, at ground speeds which for the larger swarms studied have approximated to the speed of the corresponding wind. The smaller swarms, most of them less than 10 sq. km. in extent, showed lower flying heights, relative to the corresponding vertical extent of dry adiabatic lapse rates, together with ground speeds that were also low, in relation to the wind speeds concerned and to the corresponding performance of the larger swarms.

There is some evidence of an association between rain and low flying heights, and consideration of heat exchange at the ground surface indicates that the energy normally available for convection, in the arid regions frequented by swarms, is likely to be drastically reduced after rain.

Quantitative evidence on the strength and distribution of the vertical components of air movement likely to be encountered by flying locusts was provided by pilot-balloon and accelerometer data. Twin-theodolite pilot-balloon observations in central Somalia showed that during much of the day some 10 per cent. of uniformly distributed locusts in flight at about 20 m. at any one time could be expected to experience up-currents exceeding their gliding sinking-speed. Gust-spectra recorded by aircraft accelerometer within and around high-flying swarms demonstrated up-gusts, exceeding a value equivalent to the sinking-speed of a gliding locust, at about 50 points per sq. km. among the higher-flying locusts at any one time.

The possible use of locusts as indicators of air movements is discussed, with a summary of the evidence available on the contributions made by the active behaviour of the locusts themselves to the effects observed. Attention is directed to the importance of gregarious behaviour in the continued cohesion of individual swarms, observed over many days and hundreds of kilometres, despite the disruptive effects both of atmospheric turbulence and of the apparently random orientation of the flying locusts themselves. The order of magnitude of these potentially disruptive effects is estimated for a particular case, and shown to be large compared with the variations actually observed in the extent of the swarm concerned.

THRESH (J. M.). The Control of Cacao Swollen Shoot Disease in West Africa. A Review of the present Situation.—*Tech. Bull. W. Afr. Cocoa Res. Inst.* no. 4, 36 pp., frontis., 75 refs. London, 1958.

The following is almost entirely the author's summary. In 1938, the swollen-shoot condition in cacao was shown to be caused by a virus, and since that date extensive investigations have been carried out to determine methods of curing infected plants and of checking the spread of the disease in the field. This work is summarised and discussed in this bulletin, which is based on published papers and numerous references in the Annual Reports of the West African Cocoa Research Institute.

Heat therapy and chemotherapy have failed to cure plants infected with cacao swollen-shoot virus, and there is no immediate prospect of a therapeutic method being introduced that can be used on a field scale. Control measures against the disease are thus restricted to methods of reducing transmission, which normally occurs when the mealybug vectors, of which *Pseudococcus njalensis* Laing is the predominant species in Ghana [*cf. R.A.E.*, A 39 303], move from infected cacao or wild hosts to healthy trees [*cf. 46 417*]. Various methods of reducing spread have been investigated, including the use of insecticides [*cf. 39 373; 40 364; 43 81*], eradication measures and resistant varieties [*cf. 39 371*]. The use of mild strains of virus to protect plants from the effects of the commoner virulent ones has also been considered [*cf. 44 48, etc.*]. In addition, unsuccessful efforts have been made to control the mealybug populations on cacao in Ghana by the introduction of fungi [*cf. 40 364*] and exotic insect parasites and predators [*cf. 40 364; 43 80; 45 310*] to supplement the natural level of biological control exerted by indigenous species. Cutting out infected cacao trees and some of the naturally occurring hosts of cacao viruses has been the only control measure found practicable for adoption on a widespread scale by the Departments of Agriculture in Ghana and in Nigeria. In these countries, government employees inspect the cacao farms at regular intervals and

attempt to eradicate outbreaks as they are discovered. The survey parties responsible for the routine control operations are hampered by the inaccessibility of some of the farms and by difficulties experienced in detecting virus symptoms on infected trees. Nevertheless, they have achieved some success in eradicating outbreaks and in restricting the build-up of infection that would have occurred had no control measures been practised. The eradication measures have been particularly successful in areas in which the incidence of virus was not high and it was possible to destroy the apparently healthy trees immediately round each outbreak. In the immediate future, eradication measures are likely to be continued as the basic method of controlling swollen-shoot disease. However, they may be made more efficient by the use of insecticides to control the mealybugs on the standing trees that occur round treated outbreaks and which may include missed or latent infections. Preliminary results with dimefox (bis(dimethylamino) fluorophosphine oxide), a systemic insecticide [cf. 44 5; 45 309], and with formicides [cf. 43 81; 46 211] against ants that tend the mealybugs [cf. 39 369], have given encouraging results and warrant further investigations, so that definite recommendations can be made.

To maintain production in areas affected by swollen-shoot disease it is essential to replant cacao wherever infected trees are cut out. Replanting can usually be carried out successfully on the better soils, and the evidence indicates that the annual losses due to swollen-shoot disease are small if the new cacao is brought under regular inspection and is not immediately adjacent to infected trees. It may be possible to decrease the rate at which new plantings become infected, by the use of resistant varieties and barrier crops, or insecticides may be used to restrict the build-up of mealybug populations on the young trees. Alternatively, new planting material may be protected from the effects of virulent virus by the use of mild strains.

LAVABRE (E. M.). **Le sphinx du caféier et les moyens de le contrôler.**—*Café, Cacao, Thé* 1 no. 3 pp. 132–133, 2 figs., refs. Nogent-sur-Marne, 1957.

An outbreak of *Cephonodes hylas* (L.) occurred in May 1957 on coffee at Lelem in the Mungo region of the French Cameroons, causing severe defoliation. The adult, larva and pupa of this Sphingid are briefly described. The eggs are laid singly on the foliage and hatch in 3–4 days, and the larvae feed on the lower surfaces of the leaves for about three weeks. The prepupal and pupal stages, which together also last three weeks, are passed in the soil or beneath debris. DDT and rotenone have been used against the larvae, but did not prove satisfactory. Endrin in a dilute emulsion spray gave complete control.

GEORGHIOU (G. P.) & SHIAKIDES (T.). **Host Plants of the Cereal Leaf Miner (*Syringopais temperatella* Led.) in Cyprus.**—*Tech. Bull. Dep. Agric. Cyprus* no. 4, [1+] 3 pp., 3 refs., multigraph. [Nicosia] 1957.

Syringopais temperatella (Led.) is a pest of cereal crops in Cyprus but is not restricted to them, and a list is given of 37 species of weeds in 14 families on which it was observed feeding there, only six of which had previously been recorded. Larvae were commoner on weeds just outside cereal fields than on those in the fields themselves, indicating a preference for the cereal crops, but very few were found more than three yards beyond the edges of the cultivated areas, though they occurred on non-grazed land for distances of up to 100 yards from infested fields.

NAIR (M. R. G. K.). **On a new Caterpillar Pest of Screwpines:** *Lycaugesia longipalpis* Swinh. (Lepidoptera: Agrotidae).—*J. Bombay nat. Hist. Soc.* **54** no. 4 pp. 954–956, 5 figs., 1 ref. Bombay, 1957.

In addition to a Hispid [*cf. R.A.E.*, A **46** 323], screwpine (*Pandanus tectorius*) in Kerala is attacked by *Lycaugesia longipalpis* (Swinh.), all stages of which are briefly described. The eggs of this Noctuid are laid singly on the leaves and hatch in about five days in January. The larvae feed on the leaves at night and hide in the axils or between unopened leaves by day. In the laboratory, the larval stage lasted 37 days in January–February, and the pupal stage, which is passed in a web in the hollow of the leaf, was completed in 17 days in February. Attack is severe in the Vellayani district and renders the leaves unfit for commercial use [*cf. loc. cit.*]; it occurs throughout the year.

BANERJEE (S. N.) & BASU (A. N.). **Preliminary Studies on the Epidemiology of the Potato Aphids in West Bengal (Homoptera: Aphididae).**—*Beitr. Ent.* **6** no. 5–6 pp. 510–516, 1 graph, 7 refs. Berlin, 1956.

Myzus persicae (Sulz.) and *Aphis gossypii* Glov. are the only aphids known to infest potato in West Bengal. They are anholocyclic, no oviparae or males having been observed, and highly polyphagous; their various food-plants are noted. Both are already abundant when potato is planted and persist on the crop for most of the season. In investigations in a small field near Calcutta in which potatoes were planted in the first week of December 1955, counts of aphids were made, usually at weekly intervals, from 30th December, by the method described by Broadbent [*R.A.E.*, A **37** 413]. The population was fairly high, and *A. gossypii* was the more numerous of the two. In both species, alate females and immature apterae predominated until 6th January, after which alates became scarce; the numbers of each species rose gradually until 20th January and more rapidly thereafter, reaching a peak on 3rd February. By 10th February, the population of *M. persicae* had fallen slightly and that of *A. gossypii* by more than half, and the proportion of alates was increasing in both species. On 24th February, two weeks before harvest, numbers were negligible. A decrease in the water content of the plants and the hardening of the foliage appeared to be responsible for the increase and final predominance of alates. Most aphids occurred on the middle leaves and fewest on the upper ones.

KOCHER (C.) & TREBOUX (J.). **Über die insektizide Wirkung von Diazinon-belägen in Abhängigkeit der Brühenkonzentration.** [The insecticidal Effect of Diazinon Deposits in Relation to Spray Concentration.]—*Anz. Schädlingssk.* **30** pt. 7 pp. 104–107, 20 refs. Berlin, 1957.

An account is given of experiments in which house-flies [*Musca domestica* L.] of a laboratory strain resistant to DDT were exposed for two hours to the deposits resulting from applications of diazinon (O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate) at 200 mg. in 10–100 ml. spray per sq. metre and observed for knockdown at intervals during the test period. A wettable-powder and an emulsion spray were compared on both paper and leaves, the flies being exposed at intervals of 1–13 days after application of the sprays, and the results showed that effectiveness increased in general as the quantity of spray in which the insecticide was applied decreased. The increase in effectiveness was greater on the leaves, particularly for the wettable-powder sprays. A possible reason for the increase was that the diazinon in the smaller quantities of more concentrated spray was

deposited discontinuously in droplets, so that it had a more rapid effect than in the even films resulting from the greater quantities of weaker spray and vaporised less rapidly; furthermore, large quantities of water are thought to accelerate the vaporisation of diazinon.

The difference in effectiveness was much less when wettable-powder sprays containing both diazinon and DDT were applied to wood and paper and the flies exposed to the deposits 1-60 days later. This is attributed partly to a stabilising effect of the DDT on diazinon.

WEILER (N.). **Beitrag zur Verbreitung der Erdbeerblattlaus *Pentatrichopus fragaefolii* Cock. im Erdbeeranbauggebiet Hessen-Nassau.** [Contribution to the Distribution of *Capitophorus fragaefolii* in the Strawberry-growing Area of Hessen-Nassau.]-*Anz. Schädlingssk.* **30** pt. 7 pp. 107-109, 2 figs., 1 ref. Berlin, 1957.

Strawberry is being increasingly grown, partly for planting material, in Hessen-Nassau, particularly in the Taunus and Odenwald districts. *Capitophorus* (*Pentatrichopus*) *fragaefolii* (Ckll.) was recorded on the plants in the Taunus [cf. *R.A.E.*, **A 46** 202], and observations in November 1955 showed that it was also present in the Odenwald. All of 16 plantings near Reichelsheim were found to be infested, and counts on one of them showed that the aphid increased in numbers until 15th December, when over 20 per cent. of the population consisted of mature or immature alates. Temperatures in February 1956 were extremely low, but small numbers of apterae survived, though the population began to increase again only in September. The increase began earlier on some of the other plantings. A few of the plants showed symptoms of virus infection, and aphids that had fed on these caused the appearance of typical symptoms of crinkle disease on wild strawberry (*Fragaria vesca*).

BORCHARDT (G.). **Über das Freilandvorkommen und die Überwinterung von *Myzus ascalonicus* Doncaster.** [On the Field Occurrence and Overwintering of *M. ascalonicus*.]-*NachrBl. dtsh. PflSchDienst* **10** no. 1 pp. 9-10, 6 refs. Stuttgart, 1958.

Myzus ascalonicus Doncaster, which was observed in Germany for the first time in 1950 [*R.A.E.*, **A 43** 144] was found in March 1955 in glasshouses in the Hanover district, where it had probably been earlier mistaken for *M. (Myzodes) persicae* (Sulz.). It was subsequently found to be generally numerous in the glasshouses from autumn to spring. It was observed in the field for the first time in this region on 16th September 1955, on dahlias near Lüneburg, and again on 20th October 1956 on strawberry and roses in a garden near Bersenbrück, in the west of Lower Saxony, where a total of 108 apterae (the majority of them immature) occurred per 100 strawberry leaves. It was subsequently observed on strawberry plants near Hanover on 7th-15th December and on leaves from 23 of 32 plantings in various parts of the region on 17th-18th December. Immature aphids predominated, and the intensity of the infestation varied greatly, the maximum number recorded per 100 leaves being 39 adult and 88 immature apterae. No parasitised individuals were seen. Infestation persisted in January-February 1957, and chilled individuals taken from plants under snow were successfully reared on onion in the laboratory. The aphid was present in 22 of 35 fields examined in March-April 1957, when only young leaves were attacked and the highest number per 100 leaves comprised 3 immature alates, and 10 adult and 83 immature apterae. The infestation apparently caused no injury to the leaves. *M. ascalonicus* was also observed overwintering in the open

on several wild and garden plants, and its occurrence in the field at this season was evidently favoured by the unusually mild conditions prevailing.

MÜLLER (H.). **Leguminosenknöllchen als Nahrungsquelle heimischer Micropezidae- (Tyliidae-) Larven (Diptera). Zur Morphologie und Biologie der bisher unbekannten Larve von *Micropeza corrigiolata* L. (*Tylos corrigiolatus* L.).** [The Nodules of Leguminosae as a Source of Food of indigenous Micropezid (Tyliid) Larvae. The Morphology and Biology of the hitherto unknown Larva of *M. corrigiolata* L. (*T. corrigiolatus* L.).]—*Beitr. Ent.* 7 no. 3-4 pp. 247-262, 20 figs., 19 refs. Berlin, 1957. (With Summaries in English & Russian.)

The following is based on the author's summary. Descriptions are given of the immature stages of *Micropeza corrigiolata* (L.), larvae of which were found boring in the root nodules of pea, red clover (*Trifolium pratense*) and lucerne near Leipzig in 1956. They became full-fed in summer and overwintered, and adults were observed in numbers in the fields in June and July.

DOMES (R.). **Ursachen für das ungleiche Ausreifen von Himbeeren (Thysanoptera: Thripidae; Coleoptera: Byturidae).** [Causes of the unequal Ripening of Raspberries.]—*Beitr. Ent.* 7 no. 3-4 pp. 263-267, 1 pl., 9 refs. Berlin, 1957. (With Summaries in English & Russian.)

The following is based on the author's summary. Raspberries showing unequal ripening of the drupelets near Mannheim were found to have large numbers of nymphs, pupae and adults of *Frankliniella intonsa* (Tryb.) in the central hollow or to be infested by *Byturus urbanus* (Lind.) (*tomentosus*, auct.). The transition from damaged to undamaged drupelets was sharp when *Byturus* was the cause and more diffuse when the thrips was responsible.

FRITZSCHE (R.), WOLFFGANG (H.) & OPEL (H.). **Untersuchungen über die Abhängigkeit der Spinnmilbenvermehrung von dem Ernährungszustand der Wirtspflanzen.** [Investigations on the Dependence of Spider-mite Increase on the State of Nutrition of the Food-plants.]—*Z. PflErnähr. Düng.* 78 (123) pt. 1 pp. 13-27, 5 graphs, 19 refs. Weinheim, 1957. (With a Summary in English.)

The following is based on the authors' summary. In experiments in Germany, bean plants (*Phaseolus vulgaris*) were grown in nutrient solutions, some of which were deficient in potassium, phosphorus or nitrogen, and infested with *Tetranychus telarius* (L.) (*urticae* Koch). Increase of the mites was greater on the plants grown in deficient solutions than on those with complete nutrition and was greatest of all on those lacking potassium. The increase in population on the deficient plants was related to an increase in the nitrogen content of the leaves, particularly in insoluble nitrogen compounds, glutamin and glutamic acid, and in their content of reducing sugars. In a field experiment with beans of two varieties, infestation was greater on the one that contained more nitrogen and reducing sugars in the leaves than did the other.

SCHIMITSCHEK (E.). ***Boarmia bistortata* Goeze als Lärchenschädling.** [*B. bistortata* as a Pest of Larch.]—*Z. angew. Ent.* 40 pt. 1 pp. 37-51, 16 figs., 12 refs. Hamburg, 1957. (With a Summary in English.)

The author reviews the literature dealing with outbreaks in Europe and Siberia of *Boarmia bistortata* (Goeze), of which he considers *B. crepuscularia*

(Hb.) to be a biological form, describes its immature stages and gives an account of observations on this Geometrid during an outbreak that began in a plantation of Japanese larch [*Larix leptolepis*] in Schleswig-Holstein in 1954, causing complete defoliation of many trees.

Damage by the larvae was already heavy in August 1954, when the observations began, and was more severe near the edges of the stands than in their interior. The pupae overwintered in the thin layer of fallen needles between the soil and the moss, but mortality during the winter of 1954-55 was high and adult emergence did not begin until 4th June in 1955, owing to unfavourable weather. Larvae of the first generation caused little damage, ceased feeding in mid-July and pupated by the end of the month. Feeding by second-generation larvae was heavy, even in the interior of the stands, becoming considerable by the end of August and increasing in intensity until mid-September, by which time some 40 per cent. of the larvae had pupated and infestation had spread to other trees. The numbers of pupae in the litter reached a maximum of about 130 per sq. yd. (near the edge of one stand) in November. In 1956, when the spring was warmer, adult flight probably began about 18th April, and adults were observed in numbers on 26th April. The ratio of reared males to females was 59:41, and as many as 60 egg-masses were found on a single trunk at the end of April.

When 300 overwintered pupae were collected in late March 1955 and reared in the laboratory, 75 males and 71 females emerged by 9th April. They paired 1-2 days later and the first eggs were laid on 2nd April, one female laying a total of 207 in three masses. Oviposition occurred mainly beneath the bark scales. Larvae were present from 8th April; they pupated between 1st and 19th May, but only a small proportion of the adults emerged the same year, these doing so between 20th May and 16th July. Of the remaining pupae, 13 were parasitised by Ichneumonids, 126 were killed by *Isaria farinosa* and 15 died from unknown causes. Of 138 second-generation pupae collected on 5th-6th August 1955 and reared, 49 were normal and 89 parasitised by Ichneumonids, which emerged between 10th August and 2nd September. The Ichneumonids comprised *Ichneumon nigritarius* Grav., *I. pachymerus* Htg., *I. locutor* Thnb., *Blaptocampus nigricornis* (Wesm.) and *Pimpla instigator* (F.). The first two were the most numerous and the only ones previously recorded among the parasites of *Boarmia bistortata*, a list of which is given. In a rearing test, males and females of *I. nigricornis* were placed with older host larvae on 2nd May 1955; adult parasites emerged from 7th June to 20th July, the shortest time required for development being 35 days.

GAUSS (R.). **Die Lärchenminiermotte, *Coleophora laricella* Hb., ein neuer Schädling an der Douglasie?** [*C. laricella*, a new Pest of Douglas Fir?]—*Z. angew. Ent.* 40 pt. 1 pp. 52-54, 2 figs., 13 refs. Hamburg, 1957.

Coleophora laricella (Hb.), a well-known pest of larch in Europe, was found infesting young Douglas fir [*Pseudotsuga menziesii*] near Karlsruhe in 1956. It had previously been reported from this tree in Austria [*R.A.E.*, A 21 437] and Holland [21 533], but not Germany. Examination of twigs received for identification in March showed that infested needles contained up to four larval mines each, and eggs were also observed. Cases spun on the terminal shoots, resembling those in which *C. laricella* overwinters on larch, contained a few living and many more dead larvae, and the high mortality is attributed to the unsuitability of the needles as food rather than to the severe but short winter.

WICHMANN (H. E.). **Zur derzeitigen Verbreitung des Japanischen Nutzholzborkenkäfers *Xylosandrus germanus* Blandf. im Bundesgebiete.** [On the present Distribution of *Xyleborus germanus* in Federal Germany.]—*Z. angew. Ent.* **37** pt. 2 pp. 250–258, 2 maps, 16 refs. Berlin, 1955. **Einschleppungsgeschichte und Verbreitung des *Xylosandrus germanus* Blandf. in Westdeutschland (nebst einem Anhang: *Xyleborus adumbratus* Blandf.).** [The History of the Introduction of *Xyleborus germanus* into western Germany and its Distribution there (with an Appendix: *X. adumbratus*).]—*Op. cit.* **40** pt. 1 pp. 82–99, 4 figs., 8 refs. Hamburg, 1957. (With a Summary in English.)

In the first of these papers, the results are given of investigations carried out from June to December 1954 in south-western Germany on the distribution of the introduced *Xyleborus* (*Xylosandrus*) *germanus* Bldf. [*cf. R.A.E.*, **A 43** 19, etc.]. It was already known to occur in forest districts near Darmstadt and Heilbronn and in the extreme south of the Palatinate, and a list is given of 21 further localities in the same general areas, and also near Karlsruhe and in the south of the Black Forest, in which it was present. It attacked stumps and felled trunks, and occasionally unhealthy standing trees, and is recorded from eight species of broad-leaved trees and two conifers: it was most commonly found on oaks and beech.

In the second paper, investigations on the distribution of the Scolytid in 1955 and the way in which it was introduced into Germany are described, and its spread and possible status as a pest are discussed. It was found in 34 more localities, mainly near Karlsruhe and Heilbronn, and its known distribution in Germany is shown on a map. The beetle is thought to have been introduced between 1907 and 1929 with oak logs imported from Japan. It probably first became established at Bruchsal, but the way in which it spread to other areas is not known, although logs that might contain overwintering females are transported considerable distances and might give rise to infestation if not sawn up the same year. The beetle has only a moderate capacity for active spread and was absent in 1955 from some localities in the south of the Black Forest in which it had been found in the previous year. There is only one generation a year. The stumps, which are the most important oviposition sites, are usually attacked only if they are without shoots, while oviposition on felled trunks usually occurs in places from which the bark has been removed during felling. The Scolytid is at present of no economic importance.

In an appendix, young females of *X. adumbratus* Bldf. are stated to have been found in 1955 at Neuwied, near Koblenz, in oak imported from Japan. This species, which is widespread and attacks many broad-leaved trees in Japan, had not previously been recorded from Europe.

HAINE (E.). **Periodicity in Aphid Moulting and Reproduction in constant Temperature and Light.**—*Z. angew. Ent.* **40** pt. 1 pp. 100–124, 11 figs., 27 refs. Hamburg, 1957. (With a Summary in German.)

Since a periodicity has been observed in the moulting of *Aphis fabae* Scop. in the field in Britain [*cf. R.A.E.*, **A 44** 398; **46** 148], laboratory tests were carried out with this aphid and *Myzus persicae* (Sulz.) to ascertain whether a similar one and also a periodicity in reproduction would occur in the laboratory under constant conditions of temperature and light. The following is taken from the author's summary of the results. Preliminary experiments showed that peaks of moulting and parturition occurred during the morning and afternoon, but they did not prove statistically significant unless the populations had been kept for 3–4 weeks in conditions of constant light and fairly constant temperature. When this was done, moulting of *A. fabae*

showed significant peaks at 9 a.m., 5 p.m. and 7 p.m. and a depression at midday. Populations of *M. persicae* preliminarily conditioned in constant light and temperature, in constant light and slightly changing temperature, or in alternating light and darkness maintained for 12 hours during the day or the night developed rhythms in moulting and parturition that were continued in constant light and temperature with a remarkable persistence, maxima of activity generally being observed from 3-4 to 8 a.m. and from 3-4 to 8 p.m. Though it appeared that environmental factors other than temperature and light were responsible for these changes in activity, there was no correlation with variations in relative humidity or barometric pressure, daily hours of sunshine or the times of sunrise and sunset.

BÖHM (O.). **Bemerkungen zur Lebensweise und Bekämpfung der Buchsbaumgallmücke (*Monarthropalpus buxi* (Lab.))**. [Observations on the Bionomics and Control of *M. buxi*.]—*Pflanzenschutzberichte* 17 pt. 3-4 pp. 44-52, 11 refs. Vienna, 1956. (With a Summary in English.)

Infestation of box (*Buxus sempervirens*) by *Monarthropalpus buxi* (Lab.) is common near Vienna and was particularly severe in one nursery in the winter of 1951-52. Work elsewhere on the effectiveness of insecticides against this Cecidomyiid is briefly reviewed [cf. *R.A.E.*, A 39 379; 40 332; 43 215], and an account is given of investigations on its bionomics and control. It had one generation a year, the larvae overwintering in the galls and pupating in them in spring. The pupal stage lasted about three weeks, and the adults generally emerged in the second half of May. Some of the larvae in cool, shaded positions developed more slowly than the rest and died when the damaged leaves fell, but there appeared to be no relation between the number of larvae developing in a leaf and the proportion that gave rise to adults. The larvae were parasitised by *Tetrastichus flora* (Gir.) in some localities, thought not in all, and considerable control was afforded in some cases, the population being reduced by up to about 20 per cent. in March-May; the Eulophid pupated in the galls in May, and infested plant material brought to the laboratory in 1952 yielded adults in the first half of June. Many larvae were also killed by birds, which opened the galls.

Tests on chemical control were carried out in 1952. In the first, sections of a heavily infested hedge were sprayed to run-off on 11th March, and leaves were examined four weeks later. The percentage reductions in larval population were about 74, 96 and 98 for 0.03, 0.05 and 0.075 per cent. Systox [diethyl 2-(ethylthio)ethyl phosphorothioate (demeton)], 75, 99 and 100 for 0.1, 0.3 and 0.5 per cent. Pestox III H [66 per cent. schradan] and 94 for 0.1 per cent. of a preparation containing 45-47 per cent. parathion. Counts of the numbers of adults emerging at the end of May confirmed these results, and observations on 18th November showed that the treated sections were free or nearly free from infestation. Untreated ones were heavily infested, and it is therefore concluded that the adults tend to remain on the plants on which they have developed. In a laboratory test, twigs bearing infested leaves were immersed in insecticide for one minute or sprayed to run-off on 12th March and examined 14 days later. The percentage reductions in population given by immersion and (in brackets) spraying were 100 (97) and 100 (99) for 0.05 and 0.075 demeton, respectively, 92 (79) for 0.1 per cent. Pestox, 100 (100) for 0.3 or 0.5 per cent. Pestox, and 83 (71), 100 (99) and 100 (100) for 0.06, 0.1 and 0.2 per cent. of the parathion preparation, respectively. Since the insecticides appeared so effective against the older larvae and the younger ones might be still more susceptible, a further field test was carried out. In this, sections of hedge were sprayed or dusted on 20th May, at the beginning of the adult flight period, and some of the plants were treated again on 5th June, towards

the end of it. Examination on 4th September of plants treated once showed that infestation was very light for a spray of 0.05 per cent. demeton, light for sprays of 0.3 per cent. Pestox or 0.06 per cent. of the parathion preparation and high for a DDT dust. Examination on 18th November of plants treated twice showed that infestation was completely controlled by demeton or Pestox, very light for parathion, and high for DDT, which evidently had no effect except on the adults. It was very heavy on untreated sections.

KURIR (A.). **Termitengefahr für Österreich und somit für Zentraleuropa durch die Gelbfüssige Termite** (*Reticulitermes flavipes* Kollar). [Termite Danger to Austria and thus to Central Europe through *R. flavipes*.]—*Holzforsch. u. Holzverwert.* (Mitt. öst. Ges. Holzforsch.) **10** pt. 1 pp. 8–15, 14 figs., 34 refs. Vienna, 1958. (With a Summary in English.)

The subterranean termite, *Reticulitermes flavipes* (Koll.), occurs principally in the United States and Canada, but was originally described in 1837 from hothouses near Vienna, where it was later eradicated. Renewed occurrence of this termite in Austria was confirmed in 1955, when it was found in the timber of buildings at a paper factory at Hallein, near Salzburg. It is thought to have been introduced as early as 1950 or 1951 in wooden boxes from Hamburg, where the termite was first observed in 1937 [*R.A.E.*, A **41** 232, etc.]. Beech flooring was apparently first attacked, followed by door-posts of spruce and larch, and, by 1957, in spite of the cold, damp climate, there were several hundred nests and the attack had spread to timbers in several buildings. A few nests were also found some 220 yd. away, and railway sleepers were attacked. No damage was observed on living plants. A scheme for the eradication of the termite is proposed. It involves the destruction of all buildings in the infested areas, the burning of all wood in them and the treatment of the brick and mortar debris with a contact insecticide, treatment with contact insecticides and deep ploughing of the cleared ground and finally fumigation of the soil. Less radical methods are also outlined.

PETERSEN (B. B.) & SØGAARD (B.). **Studies on Resistance to Attacks of *Chermes cooleyi* (Gill.) on *Pseudotsuga taxifolia* (Poir.) Britt.**—*Forstl. Forsøgsv. Danm.* **25** pt. 1 pp. 37–45, 2 figs., 5 refs. Copenhagen, 1958. (With a Summary in Danish.)

Of 33 clones of Douglas fir, *Pseudotsuga menziesii* (*taxifolia*), grown for three years in the greenhouse in Denmark, 32 became infested by *Chermes cooleyi* Gill. and one remained completely free from attack. The infested clones showed considerable differences in susceptibility to the insect, as assessed by the wax deposits on them.

PETERSEN (B. B.). **Bladhvepsen *Lygaeonematus abietinus* Christ. 2. Fortsatte bekaempelsesforsøg og disses indvirkning på parasiteringen af larvestadiet.** [The Sawfly *Pristiphora abietina*. 2. Continued Control Experiments and their Effect on the Parasitism of the larval Stage.]—*Forstl. Forsøgsv. Danm.* **25** pt. 1 pp. 49–61, 2 graphs, 6 refs. Copenhagen, 1958. (With a Summary in English.)

Infestation by *Pristiphora* (*Lygaeonematus*) *abietina* (Christ) persisted at a high level in part of a spruce plantation in South Jutland in which investigations had been begun in 1949 [*cf.* *R.A.E.*, A **45** 122], and further control

operations became necessary in 1955 and 1956. A spray of 0.85 per cent. parathion was applied at about 1.8 gal. per acre by aeroplane in June, when oviposition was complete and before the principal parasites of the larvae had appeared, and larval mortality was estimated at 95 and 91 per cent. in the two years, respectively. The most important of the parasites concerned were *Polyblastus flavicauda* (Roman) and *Eclytus exornatus* (Grav.). In 1955, spraying caused a doubling of the percentage parasitism and a great increase in the numbers of parasite eggs deposited per larva in the treated as compared with the untreated area, but the absolute number of parasitised larvae was much less and parasitism consequently no greater than usual in 1956. Damage by the sawfly was high in the sprayed area in 1957, possibly because of immigration from surrounding areas.

VAN DE POL (P. H.). **De middellandse-zeevlieg.** [The Mediterranean Fruit-fly.]—*Meded. Dir. Tuinb.* 20 pp. 36–38, 3 figs. The Hague, 1957. (With a Summary in English.)

The author recapitulates the circumstances in which *Ceratitis capitata* (Wied.) was found to have overwintered in the field in Holland [*R.A.E.*, A 45 34], and states that, in addition to the seven puparia investigated in the laboratory in May 1956, a further 25, some of which appeared to be living, were obtained from the soil beneath the peach trees and kept for record of the date of possible adult emergence. No adults emerged, and none was found in the field in 1956.

VERBEKE (J.). **Biology and Parasites of *Coleophora frischella* Linnaeus (*Lepidoptera Coleophoridae*).**—*Bull. Inst. Sci. nat. Belg.* 33 no. 41, 27 pp., 17 figs., 18 refs. Brussels, 1957.

Coleophora frischella (L.) was common on wild *Melilotus* in southern Belgium and north-eastern France in 1957. Observations on its bionomics, which are described in detail, showed that it has one generation a year, the adults occurring in June–July and the larvae, which are common in August, overwintering when full-fed and pupating in spring. Ten species of parasites were reared from it, and observations are recorded on the bionomics of the five main ones, *Habrocytus milleri* Delucchi & Verbeke, *Bracon osculator* Nees, *Pristomerus orbitalis* Hlmgr., *Angitia majalis* (Grav.) and *Ephialtes brevicornis* (Grav.), of which all occurred in France and the last two, which were by far the commonest, also in Belgium.

GASSER (R.). **Il problema degli Acari in frutticoltura, viticoltura e floricoltura.** [The Problem of Mites in the Cultivation of Fruits, Vines and Flowering Plants.]—*Boll. Zool. agr. Bachic.* 22 (1956) pp. 81–142, 5 pls., 1 fig., 10 pp. refs. Milan, 1957. (With Summaries in German, English & French.)

This is a review from the literature of the distribution, morphology, bionomics, economic significance, natural enemies and chemical control of the more important of the mites that infest fruit trees and bushes, vines and ornamental plants in Europe.

MARTELLI (M.). **Osservazioni sull'etologia della *Coleophora anatipennella* Hb. (*Lepidoptera Coleophoridae*).** [Observations on the Bionomics of *C. anatipennella*.]—*Boll. Zool. agr. Bachic.* 22 (1956) pp. 247–255, 5 figs., 11 refs. Milan, 1957.

Larvae of *Coleophora anatipennella* (Hb.) were observed in 1947–49 damaging the flower buds of apple in Calabria. The author reviews the

distribution and food-plants of this Coleophorid, which occurs in many European countries and seems to prefer rosaceous plants, and describes its morphology and bionomics [cf. *R.A.E.*, A 29 26; 32 143]. It has one generation a year in Italy. The adults emerge in the last ten days of June and throughout July and pair within a day, and the females lay about 100 eggs each, singly, over a fortnight or more on the leaves, usually on the lower surfaces. The larvae hatch in about a fortnight and immediately enter the leaves, which they mine. They live in cases, which are enlarged as they grow, and they frequently change their feeding site, one larva thus making 30-40 attacks on a single leaf. The first mines are small, but the later ones are larger, appearing as rounded spots on the leaves. The larvae cease feeding in early October, in the second or third instar, and hibernate on the branches until the buds swell in spring, when they attack the buds and skeletonise the newly opened leaves, feeding on the lower surfaces and causing considerable damage. They pupate on the leaves or branches in late May or early June, and the adults emerge about three weeks later. Control measures should be applied in spring, as soon as the buds swell, and sprays of 0.4 per cent. lead arsenate or 5 per cent. refined mineral oil emulsion gave good results.

FERRIÈRE (C.) & DELUCCHI (V.). **Les hyménoptères parasites de la mouche des olives. I. Les chalcidiens de la région méditerranéenne.**—*Entomophaga* 2 no. 2 pp. 119-124, 12 refs. Paris, 1957. (With Summaries in English & Italian.)

The authors give a key to the five species of Chalcidoids known as parasites of *Dacus oleae* (Gmel.) on olive in countries of the Mediterranean basin, followed by notes on their identification, synonymy and nomenclature. They are *Eurytoma rosae* Nees, which parasitises Cynipids in northern and central Europe and *D. oleae* in the south and of which some examples from southern Spain resembled *E. nigrita* Boh., though the resemblance was not constant enough for this name to be applied to them [cf. *R.A.E.*, A 43 373]; *Cyrtoptyx* (*Dinarmus*) *dacicida* (Masi), of which material was received from Greece (notably Crete), Italy and Libya and of which *Dinarmus virescens* Masi and *D. lesbiacus* Masi [11 3] are synonyms; *Eupelmus urozonus* Dalm., which attacks insects of several orders and is recorded from *D. oleae* in Spain, Italy and Greece; *E. martellii* Masi, which replaces *E. urozonus* in North Africa and was received from Libya; and *Pnigalio mediterraneus*, sp.n. This last was formerly misidentified as *P. longulus* (Zett.) [cf. *loc. cit.*], but examination of the type of the latter from Finland showed it to be distinct. The true *P. longulus* is recorded from larvae of *Lyonetia clerkella* (L.) in Switzerland and Germany. Since *P. mediterraneus* was well described by Masi under the name *longulus* in 1907, no full description is given, but a key differentiating the two species is included.

BURGERJON (A.). **L'utilisation des chenilles de *Pieris brassicae* L. comme "insecte test" de laboratoire dans un service de contrôle de préparations pathogènes insecticides.**—*Entomophaga* 2 no. 2 pp. 129-135, 2 figs., 4 graphs, 7 refs. Paris, 1957. (With a Summary in English.)

Larvae of *Pieris brassicae* (L.) have been found in France to be good test insects for the evaluation of sprays or dusts containing pathogenic organisms. They are kept in oblong plastic boxes of the type used to store butter, in

which ventilation holes are bored and covered with wire gauze. The boxes have a sheet of filter paper on the bottom, and a piece of cabbage leaf about 3 × 5 in. in size is treated with the preparation in a dusting or spraying tower and placed on this; 25 third-instar larvae are then introduced and left for 48 hours, after which preliminary mortality counts and feeding measurements are made and the treated leaf replaced by a fresh untreated one. Further counts are made and fresh leaves supplied at successive 48-hour intervals. Two boxes are used for each concentration of the preparation, and they can easily be stored one on top of another in the laboratory. Four leaf pieces are treated at a time. The data obtained in tests of sprays containing spores of *Bacillus thuringiensis* [cf. *R.A.E.*, A 45 126] are presented to show the regularity of the results obtained, and the necessity for the use of constant temperatures and of insects of the same age is stressed.

COUTIN (R.) & HENNEQUIN (J.). **Contribution à l'étude des procédés de lutte contre la mouche de l'asperge.**—*Phytiat.-Phytopharm.* 6 no. 2 pp. 93–100, 3 figs., 6 refs. Paris, 1957.

Platyptarea poeciloptera (Schr.) is an important pest of asparagus in France, the adults emerging between mid-April and the end of May and laying their eggs in the shoots and the larvae developing and pupating in the latter. Little damage is caused when the plants are in production and the shoots gathered at frequent intervals, but injury is severe in the earlier years, particularly in the third, which is that preceding the beginning of picking. In view of the promising results of laboratory experiments against the adults [cf. *R.A.E.*, A 46 7], a field test was carried out on third-year plants in 1956. Sprays of 0.02 per cent. γ BHC (lindane) or diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] or 0.05 per cent. methyl-demeton [dimethyl 2-(ethylthio)ethyl phosphorothioate], with a wetting agent, were applied to the shoots and to the soil for a distance of a foot round the plants five times, on 30th April and 7th, 14th, 21st and 28th May, all unhealthy stalks were removed weekly and examined for infestation, and the stalks remaining in November were picked and examined for pupae. In a fourth series, all the shoots were picked daily for three weeks ending on 11th May, a practice that is considered by growers to afford control. The results, which are presented in detail and analysed statistically, showed that diazinon was significantly superior to either of the other insecticides; the latter did not differ significantly between themselves, but were significantly better than no treatment or daily picking for three weeks, which was useless. There were no constant differences in infestation between stalks picked during or at the end of the season, indicating that stalks that appear unhealthy are not necessarily infested by *Platyptarea*.

DESMORAS (J.), FURNEL (J.) & MÉTIVIER (J.). **Étude au laboratoire de l'activité insecticide et de la toxicité d'un nouvel ester phosphorique à action endotherapique.**—*Phytiat.-Phytopharm.* 6 no. 2 pp. 101–109, 4 refs. Paris, 1957.

Endothion (2-(O,O-dimethyl phosphorothiolomethyl)-5-methoxy-4-pyrone) is a white crystalline solid that melts at 90–91°C. and is soluble in water and in some but not all organic solvents. Its contact and systemic actions were investigated in laboratory tests in comparison with those of methyl-demeton [dimethyl 2-(ethylthio)ethyl phosphorothioate] and malathion and of methyl-demeton, respectively.

In the contact tests, house-flies [*Musca domestica* L.] and *Tribolium confusum* Duv. were exposed to films of materials from acetone solution in glass dishes covered with wire gauze, and *Acheta domesticus* (L.) and *Macrosiphum pisum* (Harris) (*pisi* (Kalt.)) were treated topically with solutions. The concentrations giving 50 per cent. mortality of *Musca* and (in brackets) *Tribolium*, in $\mu\text{g. per ml.}$, were 700 (over 1,000) for endothion, 60 (100) for methyl-demeton and 2 (2) for malathion, and the amounts giving 50 per cent. kill of *Acheta* and (in brackets) *Macrosiphum*, in $\mu\text{g. per insect}$, were 20 (0.28), 4 (1.21) and 12 (10), respectively.

In the tests of systemic action, nasturtiums (*Tropaeolum*) and bean plants (*Phaseolus*) were transferred to nutrient solutions containing the toxicants and infested with *Aphis fabae* Scop. (*rumicis*, auct.) and *Tetranychus telarius* (L.) (*althaeae* v. Hanst.), respectively. Endothion gave complete kill of adults and nymphs of the aphid in 30 hours at 0.8 $\mu\text{g. per ml.}$, in 54 hours at 0.4 $\mu\text{g.}$ and in 70 hours at 0.2 $\mu\text{g.}$, and 100 and 98 per cent. kill of adults and nymphs, respectively, in 95 hours at 0.1 $\mu\text{g.}$; it was ineffective at 0.05 $\mu\text{g.}$ Methyl-demeton gave complete kill of both stages in 30 hours at 0.8 and 0.2 $\mu\text{g.}$, though not at 0.4, and in 70 hours at 0.1 $\mu\text{g.}$ and 95 and 90 per cent., respectively, in 95 hours at 0.05 $\mu\text{g.}$ Against the mite, the mortality percentages in five and (in brackets) ten days were 100 (100), 98 (100), 50 (70) and 0 (0) for endothion at 4, 2, 1 and 0.5 $\mu\text{g. per ml.}$, respectively, and 100 (100) and 95 (100) for methyl-demeton at 1 and 0.5 $\mu\text{g.}$ A further test against the aphid was made by plunging one leaf of the plant in the insecticide solution and infesting the other. Endothion then gave complete kill of both stages in 40 hours at 16 or 8 $\mu\text{g. per ml.}$, in 50 hours at 4 $\mu\text{g.}$ and in 68 hours at 2 or 1 $\mu\text{g.}$, and methyl-demeton in 40 hours at 16 or 8 $\mu\text{g.}$ and in 68 hours at 4, 2 or 1 $\mu\text{g.}$

In tests of sprays, in which contact and systemic action could not be separated, nasturtium plants were treated with various concentrations and infested with *A. fabae* as soon as dry. Endothion gave complete kill of both stages in 19 hours at 40, 30 and 20 mg. per litre and in 27 hours at 10 mg., and 100 and 60 per cent. kill of adults and nymphs, respectively, in 43 hours at 5 mg., whereas methyl-demeton gave complete kill in 27 hours at 40, 30 and 20 mg. and 80 and 40 per cent., respectively, in 43 hours at 10 mg. Bean plants were infested with *T. telarius* and then sprayed. Both materials were very effective for five days, and the infestation after ten days was very light for endothion at 200 or 100 mg. per litre, though heavy at 50 mg., and medium for methyl-demeton at all three concentrations. When broad-bean plants [*Vicia faba*] were sprayed and infested with *M. pisum* 4–10 days later, endothion gave complete kill in 24 hours after four days, in four hours after five days, in six hours after seven days and in 24 hours after eight and nine days at 500 mg. per litre and in six hours after 4–8 days at 250 mg., whereas methyl-demeton did so in 24 hours after 4–8 days at 500 mg. and gave not more than 95 per cent. kill after any interval at 250 mg.

Commercial preparations of endothion in solution and methyl-demeton and parathion in emulsion concentrates were used in ingestion tests of acute toxicity to mammals, and it was found that the LD50's in mg. active toxicant per kg. body weight after five days for mice, male and female rats, and guineapigs were 17, 30, 36 and 60 for endothion, 28, 48, 55 and 80 for methyl-demeton and 8.5, 7, 4 and 10 for parathion. When endothion in methanol solution was applied to the shaved skin of the back of rabbits, the solvent allowed to evaporate, and the toxicant washed off with soap and water 24 hours later, the LD50 was 400 mg. per kg., as compared with 25 mg. for parathion under the same conditions, after three days. Evaluation by an electrometric method showed that the inhibition of cholinesterase of the serum and brains of rats caused by the ingestion of 10 mg. endothion per kg.

was less than that caused by 2 mg. parathion per kg. Atropine is very effective as an antidote in case of endoethion poisoning, and much more so than against parathion.

MISSENER (J.). **Principes de la lutte contre la première génération de la mouche de la betterave** (*Pegomya betae* Curt.).—*Phytiat.-Phytopharm.* 6 no. 2 pp. 111–117, 2 figs. Paris, 1957.

In view of the probability that infestation of beet by the first generation of *Pegomya hyoscyami* var. *betae* (Curt.) in northern France would be severe in 1957 [*cf. R.A.E.*, A 46 194], the author discusses the bionomics of this Anthomyiid and the available methods of control. These comprise mainly sprays or dusts applied against the larvae as soon as a high proportion have hatched, a single application being sufficient if made at the right time, and suitable insecticides are suggested.

FÉRON (M.). **Le comportement de ponte de *Ceratitis capitata* Wied.: influence de la lumière.**—*Rev. Path. vég.* 36 fasc. 3 pp. 127–143, 5 figs., 12 refs. Paris, 1957.

The existence of a permanent laboratory colony of *Ceratitis capitata* (Wied.) in France [*cf. R.A.E.*, A 44 143] permitted experiments on the influence of light on oviposition by that fruit-fly. A transparent plastic cage 12 in. high and 8 in. in diameter was used, and a pear was suspended in this, in normal position or upside down, and illuminated from different angles by means of fluorescent tubes which eliminated heat effects. Screens were used to delimit the illuminated areas. The temperature was 25–30°C. [77–86°F.] and the relative humidity about 70 per cent. The results are presented in outline and analysed, and the following is based on the conclusions drawn. A light intensity of 2,500 lux resulted in more oviposition than one of 50 lux, though the number of oviposition punctures made was only 1.5 times as great. When a bright area (2,500 lux) and a dim one (30–50 lux) were both available on the fruit, the dim one was chosen; when two dim lights were provided on opposite sides of the fruit, the eggs were deposited equally on all parts, and when two bright ones were provided, oviposition occurred mainly round the centre. At the moment of oviposition, therefore, the normally positive phototactic response of the flies is reversed. Independently of light effects, the lower part of the fruit was preferred. Four eggs were deposited per puncture on the average.

Supplementary observations in a peach orchard confirmed that the ovipositing females seek shaded sites for their eggs, depositing most of them in fruits in the interior of the crown or in shaded ones on the periphery.

BALACHOWSKY (A. S.). **Sur un nouveau genre aberrant de cochenille radicicole myrmécophile nuisible au caféier en Colombie.**—*Rev. Path. vég.* 36 fasc. 3 pp. 157–164, 9 figs., 13 refs. Paris, 1957.

Chavesia caldasiae, gen. et sp.n., is described from adult females found feeding on the roots of coffee and causing considerable injury in the Province of Caldas, Colombia. This Coccid is tended and distributed by the ant, *Acropyga robae* Donisthorpe, and may be the same as that recorded in association with *A. berwicki* Wheeler in Trinidad [*R.A.E.*, A 33 147]. It was also found on banana, but caused no injury to it. The genus *Chavesia* is close to *Eumyrmococcus*, and characters differentiating the two are included. Notes are given from the literature on other root-infesting Coccids associated with ants.

VIADO (G. B.), BANAAG (A. F.) & MORESTO (S. E.). **Some organic Insecticides in the Control of Cabbage Worm.**—*Philipp. Agric.* **41** no. 5 pp. 261–267, 12 refs. College, Laguna, 1957.

In view of the risk of the development of a strain of *Pieris canidia* Sparrm. resistant to endrin, which has become the standard insecticide for the control of this pest of cabbage in the Philippines, comparative tests of other insecticides were made in 1956–57. The materials tested were emulsion concentrates containing 25 per cent. DDT or 23·4 per cent. heptachlor at 2 pints and 19·5 per cent. endrin, 20 per cent. diazinon [O,O-diethyl O-2-isopropyl-4-methyl-6-pyrimidinyl phosphorothioate] or 20 per cent. Guthion [O,O-dimethyl S-(4-oxo-benzotriazino-3-methyl) phosphorodithioate] at 1 pint per 100 gal. The test cabbage plants were kept free from infestation before treatment by daily hand collection, and the sprays were applied ten times at weekly intervals beginning two weeks after transplanting. Diazinon gave complete protection throughout the season, and plants treated with it produced the highest average number (27·6) and weight (about 38·5 lb.) of marketable heads per plot of 32 plants. Endrin completely protected only 26·12 per cent. of the plants, but damage to the others was very light and the average number and weight of marketable heads per plot were 24·6 and about 32 lb. All the plants sprayed with Guthion, DDT or heptachlor were infested after eight, six and five weeks, respectively, and untreated plants after four weeks; the average number and weight of marketable heads produced by the plants treated with these materials ranged from 18·4 to 8·2 and from about 18 to about 7 lb., respectively, and the untreated plots produced averages of 4·8 and about 4 lb. An evaluation of the cost of the treatments (excluding Guthion) showed that only diazinon and endrin were economically practicable.

WOLCOTT (G. N.). **Inherent natural Resistance of Woods to the Attack of the West Indian Dry-wood Termite, *Cryptotermes brevis* Walker.**—*J. Agric. Univ. P. R.* **41** no. 4 pp. 259–311, 12 refs. Río Piedras, P. R., 1957. (With a Summary in Spanish.)

The following is based on the author's summary. From the results of extensive feeding tests with nymphs of the West Indian dry-wood termite, *Cryptotermes brevis* (Wlk.), on the wood of nearly 300 species of trees from all parts of the world, which are described [cf. *R.A.E.*, A **39** 60, etc.], it appears that natural resistance to termite attack resulting from the presence of a specific repellent constituent does not occur in any wood of the temperate zone of either the northern or the southern hemisphere. Such natural resistance is of comparatively rare occurrence in the semi-tropics, but has developed in a considerable number of trees of the tropics both of the Old and the New World. Lists of the trees are given, showing comparative indices of resistance.

PURSLow (D. F.). **Experiments on the Treatment of Redwood Sapwood by Dipping.**—*Bull. For. Prod. Res.* no. 43, iv + 10 pp., 7 pls., 2 graphs, 9 refs. London, H.M.S.O., 1958. Price 2s. 6d.

The following is based on the author's introduction and summary. Redwood (the wood of *Pinus sylvestris*) is one of the main constructional timbers used in buildings in Britain, and as the amount of sapwood in the timbers employed has gradually increased, more of it has been given preservative treatment to protect it from insects, such as *Hylotrupes bajulus* (L.), and decay. An account is here given of tests carried out to determine the

absorption, penetration and concentration of solvent-type preservatives obtained in the sapwood by dipping and steeping. White spirit, a typical solvent, was used in place of actual preservative. The average penetration obtained by a short dip was about $\frac{1}{4}$ – $\frac{3}{8}$ in. Complete penetration was obtained by immersion for several hours. The concentration of solvent in the penetrated wood was low, and it was shown that penetration is confined mainly to the rays. Penetration was shown to continue for some time after removal from the solvent, but no further movement took place after a week. The tests were carried out on a wide selection of samples. About two-thirds of the material absorbed small, consistent amounts of solvent, and the penetration was uniform. The remainder absorbed larger, but more variable, amounts, and the penetration was very irregular.

JOHNSON (B.). **Studies on the Degeneration of the Flight Muscles of alate Aphids. I. A comparative Study of the Occurrence of Muscle Break-down in Relation to Reproduction in several Species.**—*J. Insect Physiol.* 1 no. 3 pp. 248–256, 1 pl., 15 refs. London, 1957.

The following is substantially the author's summary of this account of investigations at Rothamsted. When alate aphids of several species were allowed to settle on appropriate food-plants in the greenhouse, their flight muscles began to break down within a few days [cf. *R.A.E.*, A 44 398]. The onset of muscle degeneration could be delayed by preventing the aphids from settling, either by denying them their food-plant altogether or by leaving them on a poor food-plant in darkness for several days.

The reproductive capacity of alatae before they lost the ability to fly varied for different species. Embryo development was arrested in alatae of all the species that were studied after the end of the teneral condition following the final ecdysis, and was resumed when they settled on a new food-plant. Four species, *Anuraphis roseus* Baker (*Sappaphis mali* (Ferrari)) on apple, *Aphis fabae* Scop. on broad beans [*Vicia faba*], *Brevicoryne brassicae* (L.) on cabbage and *Myzus persicae* (Sulz.) on turnip, contained fully formed embryos at the time embryo development was arrested, and these, together with a few additional embryos of which the development had been completed after the aphids settled down, were born before the ability to fly was lost. In other species, the young alatae contained only rudimentary embryos that required several days to develop to the stage at which they were normally born; in these, no larvae were born until the muscles had begun to degenerate and the ability to fly was lost. Other species fell between these two groups, and in one, *Macrosiphum solanifolii* (Ashm.) (*cuphorbiac*, auct.), on *Aquilegia*, whether or not the aphids reproduced at all before losing the ability to fly depended on their size.

The ability of alatae of *Aphis fabae* to engage in long flights of an hour or more was retained for as long as the aphids retained the ability to fly.

OSSIANNILSSON (F.). **Is Tobacco Mosaic Virus not imbibed by Aphids and Leafhoppers?**—*K. LantbrHögsk. Ann.* 24 pp. 369–374, 3 figs., 5 refs. Uppsala, 1958.

Although the salivary sheath may prevent *Myzus persicae* (Sulz.) from taking up the virus of tobacco mosaic while feeding [cf. *R.A.E.*, A 45 203], such a sheath is probably not formed immediately after insertion of the stylets [cf. 40 187] and small amounts of unfiltered sap may then be acquired, especially by aphids making repeated probing punctures. When examples of *Macrosiphum (Aulacorthum) solani* (Kalt.) and *Cicadella*

(*Eupteryx*) *atropunctata* (Goeze) were allowed to feed on infected tobacco, and *Myzus persicae*, which did not thrive on the hairy, sticky tobacco plants, on infected *Physalis floridana*, examination of preparations of the stomach contents under the electron microscope showed the presence of characteristic rods in specimens of all three species, though they were rare in the aphids.

BJÖRLING (K.) & OSSIANNILSSON (F.). **Investigations on individual Variations in the Virus-transmitting Ability of different Aphid Species.**—*Socker* 14 no. 1 pp. 1–13, 1 fig., 16 refs. Malmö, 1958.

The following is based on the authors' summary. During 1954–57, glass-house tests were made in Sweden to study the capacity to transmit persistent viruses of some 100 asexually reared strains of *Myzus persicae* (Sulz.), *M. ascalonicus* Doncaster, *M. (Aulacorthum) circumflexus* (Buckt.), *Macrosiphum* (A.) *solani* (Kalt.), *M. solanifolii* (Ashm.) (*euphorbiae* auct.), and *Aphis fabae* Scop. The tests aimed at investigating partly the size and character of the variation in virus-transmitting ability within some of the species, especially *Myzus persicae*, and partly the differences in the same respect between the species. The two viruses studied were those of beet yellows and potato leaf-roll.

Following preliminary investigation of the causes of modificatory variations in the frequency of virus transmission within one and the same strain of aphid, significant and in several cases statistically certain differences in virus-transmitting ability were shown between different strains of *M. persicae* for both yellows virus and potato leaf-roll. These differences between strains of the same species seemed to be genetically determined. In certain strains, the differences remained of the same order in successive tests with yellows virus over a period of more than three years. Furthermore, in one of two successful crosses between strains of *M. persicae*, the descendant significantly differed from the parent strains in virus-transmitting ability. Another support for the view that the differences between strains are constitutional is that in a few standard strains the differences were of the same order for both viruses. Morphological and histological investigation of individual aphids of strains of *M. persicae* differing in vector effectiveness gave no information about the causes of the differences.

Differences in ability to transmit yellows virus also occurred in a small number of strains of *A. fabae*, the difference between the most and the least effective strain being statistically certain, and similar differences seemed to exist in *M. ascalonicus*. Comparative tests between species showed that a strain of *M. persicae* with intermediate transmitting ability was much more effective in transmitting yellows virus than were strains of *A. fabae* or *M. ascalonicus*. The difference between a less effective strain of *M. persicae* and the most effective strain of *A. fabae* was negligible, however, and probably non-existent. The two strains of *Macrosiphum solanifolii*, one of *M. solani* and one of *Myzus circumflexus* tested with this virus failed to transmit.

M. persicae was also the best vector of leaf-roll, since two strains (one intermediate and one less effective) proved to be considerably better vectors than the best strain of *M. ascalonicus* and the one strain of *M. circumflexus* tested. The one strain of *Macrosiphum solani* and one of *M. solanifolii* tested with this virus failed to transmit.

Within the population investigated, the 85 strains of *Myzus persicae* could be grouped as a continuous series showing 10–80 per cent. average frequency of transmission, but it was not possible to establish any connection between virus-transmitting capacity and the plant on which the strain in question was originally found. The differences in transmission within this species

were so great that they can be assumed to influence the results of comparative tests, and the variation should be taken into consideration when such work is planned.

Outbreaks and new Records.—*FAO Plant Prot. Bull.* 7 no. 1 pp. 13–14, 2 refs. Rome, 1958.

Elasmopalpus lignosellus (Zell.) is reported by E. O. Pearson (p. 14) as attacking sugar-cane in Trinidad for the first time. The larvae caused great damage to young ratoons on one estate.

CASIDA (J. E.), GATTERDAM (P. E.), GETZIN jr. (L. W.) & CHAPMAN (R. K.).

Residual Properties of the systemic Insecticide O,O-Dimethyl 1-Carbo-methoxy-1-propen-2-yl Phosphate.—*J. agric. Fd Chem.* 4 no. 3 pp. 236–243, 5 graphs, 39 refs. Easton, Pa., 1956.

The following is based partly on the authors' summary. As Phosdrin (dimethyl 2-methoxycarbonyl-1-methylvinyl phosphate) shows considerable promise as a systemic insecticide with a short residual effect [*cf. R.A.E.*, A 41 373–374], the potential hazards involved in its use on crop plants were investigated. The technical product was prepared from radioactive phosphorus (^{32}P), and partition chromatography showed that it consisted of 66 per cent. of the α fraction or *cis* isomer and 34 per cent. of the *trans* isomer, as in an industrial sample. Experiments with plants indicated that the *cis* isomer was readily absorbed through the roots and translocated through the plant parts, but was rapidly decomposed, the half life of the radioactive material being about one day. It was itself insecticidal, and metabolism within the plant led to loss of toxicity. The *trans* isomer was absorbed at about the same rate, was lost more slowly and was only about 1 per cent. as toxic to aphids and rats as the *cis* isomer. Both isomers were highly volatile. Residues in plants treated in various ways were usually eliminated in four days and in those treated at rates sufficient for insect control in two days. Degradation appeared to be by way of enzymatic attack on the carboxylic ester group, followed by hydrolysis of the vinyl phosphate bond.

PAPERS NOTICED BY TITLE ONLY.

EUROPEAN AND MEDITERRANEAN PLANT PROTECTION ORGANISATION. **The Protection of Foodstuffs** [mainly cereals] **in Store. Second Report of the Stored Products Working Party (Springforbi, 20–23 May 1958).** [*In English & French.*]—39 pp., 4 refs. Paris, 1958.

MACNAY (C. G.) & CREELMAN (I. S.). **List of Insects and Mites affecting Tree Fruits in Canada.**—*Res. Notes Ser. Ent. Div. Dep. Agric. Can.* no. E-12, [1 +] 38 pp., multigraph. Ottawa, 1958.

WEISER (J.) & VEBER (J.). **Die Mikrosporidie *Theclohania hyphantriae* Weiser des weissen Bärenspinners und anderer Mitglieder seiner Biocönose.** [*T. hyphantriae* infecting *Hyphantria cunea* and Insects associated with it in Czechoslovakia.]—*Z. angew. Ent.* 40 pt. 1 pp. 55–70, 7 figs., 10 refs. Hamburg, 1957. (With a Summary in English.) [*Cf. R.A.E.*, A 46 289.]

THE INSECT PESTS OF COTTON IN TROPICAL AFRICA

by E. O. PEARSON

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